# Notes

The aff hurts the environment, and that is bad.

Everyone should highlight this file before they use it.

The best aff answers are the environment is resilient (it’s invincible) and nonunique (we are already hurting the environment in lots of ways now)

# Topshelf

### 1NC

#### [insert links/internal links and uniqueness]

#### Ocean biodiversity solves extinction- and turns economy and food security

Schofield, 14 --- Director of Research at the Australian Centre for Ocean Resource and Security University of Wollongong (3/10/2014, Clive, “Why our precious oceans are under threat,” <http://uowblogs.com/globalchallenges/2014/03/10/the-threats-facing-our-precious-oceans/>, JMP)

Science fiction author Arthur C Clarke once observed, “How inappropriate to call this planet Earth when it is quite clearly Ocean.” Good point, well made.

The oceans clearly dominate the world spatially, encompassing around 72 per cent of the surface of the planet.

The vast extent of the oceans only tells part of the story, however.

The oceans are critical to the global environment and human survival in numerous ways – they are vital to the global nutrient cycling, represent a key repository and supporter of biological diversity on a world scale and play a fundamental role in driving the global atmospheric system.

Coastal and marine environments support and sustain key habitats and living resources, notably fisheries and aquaculture. These resources continue to provide a critical source of food for hundreds of millions of people.

The fishing industry supports the livelihoods of an estimated 540 million people worldwide and fisheries supply more than 15 per cent of the animal protein consumed by 4.2 billion people globally.

Moreover, the oceans are an increasing source of energy resources and underpin the global economy through sea borne trade.

Overall, it has been estimated that 61 per cent of global GNP is sourced from the oceans and coastal areas within 100km of the sea.

Coasts and marine zones also provide essential, but often not fully acknowledged, ecosystem services.

Coasts and marine zones are therefore of critical importance across scales, from the global to the regional, national and sub-national coastal community levels. At the same time the oceans also remain largely (95 per cent) unexplored.

### Impact/Overview 2NC

#### prefer environment impacts—there’s an invisible threshold and it is irreversible

Diner 94 (Major David N., Judge Advocate General's Corps – United States Army, “The Army and The Endangered Species Act: Who's Endangering Whom?”, Military Law Review, Winter, 143 Mil. L. Rev. 161, Lexis)

The prime reason is the world's survival. Like all animal life, humans live off of other species. At some point, the number of species could decline to the point at which the ecosystem fails, and then humans also would become extinct. No one knows how many [\*171]  species the world needs to support human life, and to find out -- byallowing certain species to become extinct -- would not be sound policy. In addition to food, species offer many direct and indirect benefits to mankind. [68](http://www.truthnews.net/world/2004080046.htm?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a#n68) 2.Ecological Value. -- Ecological value is the value that species have in maintaining the environment. Pest, [69](http://www.nasa.gov/pdf/490945main_10-10_TFPD.pdf?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a#n69) erosion, and flood control are prime benefits certain species provide to man. Plants and animals also provide additional ecological services-- pollution control, [70](http://www.nasa.gov/pdf/432577main_Earth_Science_R1.pdf?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a#n70)oxygen production, sewage treatment, and biodegradation.[71](http://www.wired.com/science/discoveries/news/2003/05/58966?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a#n71) 3.Scientific and Utilitarian Value. -- Scientific value is the use of species for research into the physical processes of the world. [72](http://www.lexis.com/research/retrieve?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a" \l "n72" \t "_self) Without plants and animals, a large portion of basic scientific research would be impossible. Utilitarian value is the direct utility humans draw from plants and animals. [73](http://www.lexis.com/research/retrieve?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a" \l "n73" \t "_self) Only a fraction of the  [\*172]  earth's species have been examined, and mankind may someday desperately need the species that it is exterminating today. To accept that the snail darter, harelip sucker, or Dismal Swamp southeastern shrew [74](http://www.lexis.com/research/retrieve?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a" \l "n74" \t "_self) could save mankind may be difficult for some. Many, if not most, species are useless to man in a direct utilitarian sense. Nonetheless, they may be critical in an indirect role, because their extirpations could affect a directly useful species negatively. In a closely interconnected ecosystem, the loss of a species affects other species dependent on it. [75](http://www.lexis.com/research/retrieve?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a" \l "n75" \t "_self) Moreover, as the number of species decline, the effect of each new extinction on the remaining species increases dramatically. [76](http://www.lexis.com/research/retrieve?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a" \l "n76" \t "_self) 4.Biological Diversity. -- The main premise of species preservation is that diversity is better than simplicity. [77](http://www.lexis.com/research/retrieve?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a" \l "n77" \t "_self)As the current mass extinction has progressed, the world's biological diversity generally has decreased. This trend occurs within ecosystems by reducing the number of species, and within species by reducing the number of individuals. Both trends carry serious future implications. [78](http://www.lexis.com/research/retrieve?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a" \l "n78" \t "_self) [\*173]  Biologicallydiverse ecosystems are characterized by a large number of specialist species, filling narrow ecological niches. These ecosystems inherently are more stable than less diverse systems. "The more complex the ecosystem, the more successfully it can resist a stress. . . . [l]ike a net, in which each knot is connected to others by several strands, such a fabric can resist collapse better than a simple, unbranched circle of threads -- which if cut anywhere breaks down as a whole." [79](http://www.lexis.com/research/retrieve?_m=15aac6482af89f930a3e32f7a8def8da&csvc=le&cform=byCitation&_fmtstr=FULL&docnum=1&_startdoc=1&wchp=dGLbVlW-zSkAA&_md5=37ae2564ed6a714dcd205b0ee5431e9a#n79) By causing widespread extinctions, humans have artificially simplified many ecosystems. As biologic simplicity increases, so does the risk of ecosystem failure. The spreading Sahara Desert in Africa, and the dustbowl conditions of the 1930s in the United States are relatively mild examples of what might be expected if this trend continues. Theoretically, each new animal or plant extinction, with all its dimly perceived and intertwined affects, could cause total ecosystem collapse and human extinction. Each new extinction increases the risk of disaster. Like a mechanic removing, one by one, the rivets from an aircraft's wings, n80 mankind may be edging closer to the abyss.

### Brink: Ocean Fragile

#### Marine diversity is as fragile as glass

Mattison 14, BA in sculpture and marine ecology at Skidmore College with coursework at James Cook University in Australia. She then spent a year as a fellow at the Harvard Ceramics Program before completing an MA in Environmental Studies at Brown University “Marine Diversity is as Fragile as Glass,” http://mission-blue.org/2014/03/marine-diversity-is-as-fragile-as-glass/

Preservation techniques and marine exploration have advanced over the years, Cornell’s Blaschka collection fell into disuse only to be resurrected by Professor C. Drew Harvell – Associate Director for Environment at the Atkinson Center for a Sustainable Future at Cornell and Curator of the Cornell Collection of Blaschka Invertebrate Models – and restored by a glassworker named Elizabeth Brill in the last few decades. Glass Octopus vulgaris being restored at The Corning Museum of Glass. © David O. Brown. Glass Octopus vulgaris being restored by glassworker Elizabeth Brill in Corning, NY. © David O. Brown. Today, as our oceans warm and acidify and fish stocks dwindle as a result of a panoply of human-caused threats, the Blaschkas’ exquisite work is resurfacing as a stark reminder of the fragile beauty of marine life is what we stand to lose. “Marine diversity is as fragile as glass,” says Dr. Harvell. For the past 25 years, Dr. Harvell has worked to painstakingly salvage over 200 of the glass models, and now she feels it’s time to use them to spread a message of inspiration and hope for conservation. A lot has happened in the oceans in the last 150 years… We do a lot of research on climate warming impacts on coral reefs. There’s been an average of 30% change in the acidification of the oceans and that’s just average. And of http://mission-blue.org/2014/03/marine-diversity-is-as-fragile-as-glass/course there’s the changes in coastal pollution as well. Things are changing so fast that I don’t know for how much longer we’ll be able to find living representatives of the Blaschka invertebrates. – Dr. Drew Harvell1 Dr. C. Drew Harvell is curator of the Blaschka Glass Invertebrates collection at Cornell. © Jeffery DelViscio Dr. Drew Harvell is curator of the Blaschka Glass Invertebrates collection at Cornell. © Jeffery DelViscio Dr. Harvell has joined forces with marine filmmaker and former Cousteau expedition team member David O. Brown to travel the globe and document living examples of the species the Blaschkas used as references for their work in a voyage called Fragile Legacy. Harvell and Brown are traveling the globe from Cornell and the Corning Museum of Glass to the Mediterranean; Hawaii; Shoals Marine Laboratory in Maine; Wales; Friday Harbor in Washington; and Indonesia – part of the Coral Triangle Hope Spot – to retrace the Blaschkas’ sources of inspiration from over 150 years ago in today’s oceans while highlighting the sweeping changes that have taken place. This ambitious journey is already well underway, and Harvell and Brown have documented species in nearly all of those locations. Their efforts will culminate in a book by Dr. Harvell and a film about their voyage by Mr. Brown. By telling this story, Harvell and Brown are merging science, art, history and marine conservation to give the Blaschka collection a contemporary voice for ocean awareness and stewardship. Harvell and Brown are a perfect team for this mission, with thousands of hours of experience in and under water throughout their careers. Dr. Harvell has worked as a marine biologist for nearly three decades and conducts research in Indonesia and Hawaii concerning ecosystem services, overfishing impacts and the health of coral reefs within and outside marine protected areas (MPAs). David Brown spent seven years with the Cousteaus during their Rediscovery of the World project before becoming an independent marine filmmaker and teaming up with Dr. Harvell. Both Harvell and Brown have documented distinct changes in marine biodiversity and ecosystem health over the years that will be reflected in the Fragile Legacy film and book – each a time capsule to create then-and-now comparisons of species richness since the Blaschkas created their collection. By using the Blaschkas’ work as a lens to highlight the wonders of biodiversity, this project aims to spark viewers’ and readers’ curiosity about undersea habitats and how our activities – namely seafood and fossil fuel choices – affect their health. Dr. C. Drew Harvell diving on a volcanic reef wall in Indonesia. © David O. Brown. Dr. C. Drew Harvell diving on a volcanic reef wall in Indonesia. © David O. Brown. By telling a story of parallels between the fragility of the glass and the fragility of the organisms, this project is sure to draw the interest of a wide audience. While the miraculous forms and colors of living marine invertebrates may captivate some readers and viewers, others will surely be drawn to the exceptional craftsmanship of the Blaschkas’ glasswork. Dr. Harvell ties the whole story together by working on both fronts to conserve – both the living creatures and the invaluable glass models – in a dual role that adds a personal component to the story and makes it undeniably inspiring. She says, “I really spend a lot of my time imagining what the Blaschkas would have thought of this. They would be so happy to know that their collection is continuing to educate and inspire people.” Filmmaker David O. Brown taking underwater photos for Fragile Legacy. © C. Drew Harvell. Filmmaker David O. Brown taking underwater photos for Fragile Legacy. © C. Drew Harvell. The Fragile Legacy film, which actor Ted Danson of Oceana has already agreed to narrate, will “provide a high definition chronicle of marine invertebrate life in this millennium, providing perspective on which among these amazing organisms remain in the sea.”2 That sort of wakeup call couldn’t come at a better time. Signs of human impacts are everywhere – from overfishing in the Mediterranean to dynamited reefs in Indonesia and climate change in Hawaii. Brown finds it ironic that Leopold Blaschka only became enchanted by the glass-like forms of marine invertebrates when stranded under sail without the capacity for fossil fuel propulsion 160 years ago, while in turn it is fossil fuel propulsion that has begun to completely alter the chemistry of the oceans in the meantime. Overfishing – another major threat addressed in this story – has made it difficult for Harvell and Brown to locate many species of cephalopod outside of seafood markets while many of the jellyfish species are overly abundant due to lack of predators. Moreover, many of the nudibranchs, anemones and jellyfish that Harvell and Brown are searching for as living examples of the Blaschkas’ work have never been assessed for their status on the IUCN Red List of threatened and endangered species; we don’t even know how many are still out there or which ones are in trouble. I’m captivated by the magic of sessile invertebrates like corals, sponges and sea squirts — creatures vital to the ecosystem yet too often overlooked in favor of more visible animals like sharks and whales. – Dr. Drew Harvell3 Harvell and Brown have many reasons for hope despite discouraging findings. In the regions where they have been able to explore marine protected areas such as Indonesia, Hawaii and the Mediterranean, the pair has found powerful evidence that these zones of restricted use protect habitat and biodiversity. The Mediterranean, from where many of the Blaschka animals were drawn, has suffered major blows from overfishing, pollution and general overuse by humans but even there it’s possible to find glimmers of vibrancy within MPAs. Across the globe in Indonesia – the heart of coral reef biodiversity within the Coral Triangle Hope Spot – MPAs are also showing promising results by protecting many species from overfishing and dynamite and cyanide fishing. I’ve always maintained that MPAs are it… the closest thing to a universal solution there is for the ocean. – David O. Brown Finding hope amid threats will be a thread running throughout the Fragile Legacy film and book. As Brown puts it, “Hope lies in human ingenuity and human creativity.” The idea that nature is so creative as to invent these exquisite and tiny organisms parallels the idea that humans who appreciate that ingenuity can innovate to preserve and restore vital habitats to support them. After all, as Dr. Sylvia Earle says, “You have to love something before you are moved to save it.” Art – and the Blaschka collection as seen through Fragile Legacy in particular – can inspire us to care about, love and save the ocean. By giving the Blaschka collection a voice, Fragile Legacy will remind us all to take the time to slow down like Leopold Blaschka did when he was stranded at sea and appreciate the delicate beauty of marine life and our impacts on it – as well as the power of humans to celebrate it through art and inspire the global community to protect it. Dr. C. Drew Harvell holding a live nudibranch specimen before releasing it in Indonesia in November 2013. © David O. Brown As fragile as the Blaschka collection is, the animals it represents are little more than water, marvelously organized into glowing, translucent living things. As irreplaceable as the glass replicas are, the species upon which they are based are the product of millennia of evolution, carrying genetic information that, if lost, can never be retrieved. As different as today’s ocean is from that of a century ago, there is scientific consensus that the change has just begun. The sea is warming, and the very chemistry that enables many of these animals to exist is being fundamentally changed.

#### The ecosystem is fragile—minor changes can make big differences

**Peace 09, “**Increasing Ocean Acidification Is Tipping Fragile Balances within Marine Ecosystems,” http://insideclimatenews.org/news/20091201/increasing-ocean-acidification-tipping-fragile-balances-within-marine-ecosystems

The increasing amount of carbon dioxide in the world's oceans is shifting fragile balances within marine ecosystems, and it could cause unpredictable changes for sea life ranging from corals to oysters to whales, scientists say. One threat is from acidification — a chemical process that occurs when carbon dioxide from the atmosphere is absorbed into sea water, causing the water's pH level to drop. As acidification increases, scientists now worry its effects on marine life may be more wide-ranging than previously predicted. In recent months, new threats to species and signs of shifting populations have raised alarm within the scientific community. The [Center for Biological Diversity](http://www.biologicaldiversity.org/) (CBD) took one protective step this fall when it filed a [petition](http://www.biologicaldiversity.org/species/invertebrates/staghorn_coral/pdfs/Coral%20petition_10-20-09.pdf) to list 83 species of coral under the federal Endangered Species Act. The group seeks to expand on its successful 2006 petition to list elkhorn corals and staghorn corals as “endangered,” a landmark decision that marked the U.S. government’s first official recognition of climate change as an existential threat to a species. Over the coming year, the National Oceanic and Atmospheric Administration, whose [Coral Reef Watch](http://coralreefwatch.noaa.gov/satellite/index.html) tracks the health of corals worldwide, will review CBD’s petition and determine whether to assign “endangered” status to each of the 83 species on the list.

### Ethics Impact 2NC

#### Causing the animal extinction is morally unjust

Cafaro and Primack 14, PhD in Earth and Environmental Science, “Species extinction is a great moral wrong,” http://www.elsevier.com/connect/species-extinction-is-a-great-moral-wrong

And equating past extinctions due to natural causes with the possible extinction of the polar bear due to human-caused climate change fails to acknowledge the human responsibility for this threat. Karieva and Marvier suggest that the polar bear's fate depends on "two opposing trends" as "the environment changes," — when it really depends on whether or not humanity substantially reduces our greenhouse gas emissions. Extinguishing species through the continued expansion of human economic activities appears to be morally acceptable to Kareiva, Marvier and some other Anthropocene proponents, as long as this destruction does not harm people themselves. But this view is selfish and unjust. Human beings already control more than our fair share of Earth's resources. If increased human population and economic demands threaten to extinguish the polar bear and many other species, then we need to limit our population and economic demands, not make excuses that will just lead to greater ecological damage. Conservation biologists, with our knowledge and appreciation of other species, are the last people who should be making excuses for their displacement or making light of their extinction. It is particularly inappropriate for Peter Kareiva to do so, given his position as chief scientist at the Nature Conservancy, an organization dedicated to preserving biodiversity. TNC's fundraising rests in part on appeals to a strong and widely shared moral view that other species have a right to continued existence. Much of the conservation value of TNC's easements and land purchases depends on society-wide moral and legal commitments to preserve threatened and endangered species and their habitats. Kareiva and Marvier state that they "do not wish to undermine the ethical motivations for conservation action," or presumably, conservation law. Yet their articles do precisely that, with potentially disastrous implications for practical conservation efforts, particularly in the long term. To be clear: We do not think there is anything wrong with people looking after our own legitimate needs. This is an important aspect of conservation. Kareiva and Marvier are right to remind us that protecting ecosystem services for human beings is important. They are right that concern for our own wellbeing can sometimes motivate significant biodiversity preservation. We believe that people should preserve other species both for their sakes and for ours. But it is a mistake to reduce conservation solely to concern for our own well-being, or to assume that it is acceptable to extinguish species that do not benefit humans. Such an overly economistic approach to conservation leads us astray morally. It makes us selfish, which is the last thing we want when the very existence of so many other life forms is at stake. Fairly sharing the lands and waters of Earth with other species is primarily a matter of justice, not economic convenience. Natural species are the primary expressions and repositories of organic nature's order, creativity and diversity. They represent thousands of millions of years of evolution and achievement. They show incredible functional, organizational and behavioral complexity. Every species, like every person, is unique, with its own history and destiny. When humans take so many resources or degrade so much habitat that another species is driven extinct, we have taken or damaged too much and have brought a meaningful story to an untimely end.

#### We should feel an ethical obligation to protect wildlife

Dickins 14, BSc Environmental Science, “Should we allow species to go extinct?” http://www.conservation-jobs.co.uk/60348/allow-species-go-extinct/

The planet is currently in its sixth extinction period, and if species – area theory is to believed we could be losing 140,000 species a year at the moment. It comes at no surprise then that a new paper published in Biological Conservation looks at the past attitudes of conservationists towards species extinctions. In ‘Species extinction is a great moral wrong‘ Philip Cafaro suggests we have a moral obligation to protect species. Most extinctions in the past have been due to natural causes, but now we live on a planet which is increasingly shaped by the actions of man. In fact some call the current epoch we live in the Anthropocene because man is having such a big influence on the environment. Cafaro talks about one paper where the authors believe species extinction isn’t morally wrong. In ‘What is Conservation Science?’ Karieva and Marvier suggest that we need to be more realistic when the presence of animals becomes incompatible with economic development. For example, they say extinctions should be nothing to worry about as long as they don’t affect us. However, are we really immune from the impacts of species extinctions? Species which prey on or parasitise the species in question will certainly be impacted. Many animals and plants have value to us, providing food and helping draw in tourists to countries. We couldn’t imagine a world where there weren’t any cattle, so why should we let less valued species go extinct. In fact even some highly valued species, such as rhino and elephant, are slipping towards extinction because we are failing to protect them. Cafaro goes on to explain that humans benefit from many ecosystem services, such as food, fresh water, climate regulation and recreation. Therefore if ecosystems collapse due to the loss of a species we will certainly feel the effects. For example, elephants are a keystone species and their continued loss to poaching could change the entire functioning and look of the African ecosystems they reside in. Would we still visit Africa for safaris if the landscape looked completely different? In addition we should think about the destruction of the Amazon rainforest. It is believed there are still many species to be discovered in the Amazon, yet the rainforest continues to be destroyed. Trees help to regulate the planet’s climate and their destruction can only aid the current climate change we are seeing today. Some ecosystems are more likely to be resilient to change than others, but if we let extinctions happen we should proceed with caution because we may not know where the tipping point is. We need to think about if we have the right to just let species become extinct, especially in an age where we are the main cause of most extinctions. In conclusion, the paper by Cafaro finds there are mixed opinions about species extinctions in the scientific community. Human population growth certainly poses a threat to species the world over. It is going to be a challenge to reduce the number of species extinctions, especially those caused by humans. There is definitely room for us to protect species and their ecosystems as well as continue our economic development.

# Uniqueness

### U: Ocean BioD High: General

#### Experts agree that the ocean can be kept in good condition if we make an effort to prevent further harm

Jha 08 (Alok, science correspondent at the Guardian, “Total human impact on oceans mapped for the first time”, 2/14/08, The Guardian, <http://www.theguardian.com/science/2008/feb/14/ocean.ecosystems>)

Halpern said the results, which were published in the journal Science and presented yesterday to the American Association for the Advancement of Science annual meeting in Boston, still gave room for hope. "With targeted efforts to protect the chunks of the ocean that remain relatively pristine, we have a good chance of preserving these areas in good condition," he said.¶ Andrew Rosenberg, a professor of natural resources at the University of New Hampshire, who was not involved with the study, said: "Clearly we can no longer just focus on fishing or coastal wetland loss or pollution as if they are separate effects. These human impacts overlap in space and time, and in far too many cases the magnitude is frighteningly high."¶ He added: "The message for policy-makers seems clear to me: conservation action that cuts across the whole set of human impacts is needed now in many places around the globe."

### U: Ocean BioD High: US

#### Majority of US Coastal Waters rated good for water quality

US Environment Protection Agency 12 (“National Coastal Report IV”, April 2012, <http://water.epa.gov/type/oceb/assessmonitor/nccr/upload/NCCR4-Report.pdf>)

¶ Summary of the Findings¶ This report is based on the large amount of monitoring data collected primarily between 2003 and 2006 on the condition of the marine coastal and Great Lakes resources of the United States. Ecological assessment of these data shows that the nation’s coastal waters are rated fair for overall condition. With respect to the overall condition of coastal waters of the geographic regions assessed in this report, the Southeastern Alaska, American Samoa, and Guam regions are rated good; the West Coast and U.S. Virgin Islands regions are rated fair to good; the Northeast Coast, Southeast Coast, Gulf Coast, Hawaii, and Puerto Rico regions are rated fair; and the Great Lakes region is rated fair to poor.¶ The major findings of the 2003–2006 study period are as follows:¶ ¶ The overall condition of the nation’s coastal waters is rated fair, with an overall condition score of 3.0 (including Alaska, Hawaii, and the island territories; the overall condition score would be 2.5 [rated fair] if these areas were excluded). The overall condition score and rating is based on the five indices of ecological condition assessed in this report: water quality index, sediment quality index, benthic index, coastal habitat index, and fish tissue contaminants index (Tables ES-1 and ES-2). This report also assesses component indicators for the water quality index (i.e., dissolved inorganic nitrogen [DIN], dissolved inorganic phosphorus [DIP], chlorophyll a, water clarity, and dissolved oxygen) and the sediment quality index (i.e., sediment toxicity, sediment contaminants, and sediment total organic carbon [TOC]).¶ ¶ When Alaska, Hawaii, and the island territories are included in the national scores, improvements in the scores are shown for the water quality, coastal habitat, benthic, and fish tissue contaminants indices. However, when the national scores were recalculated without Alaska, Hawaii, and the island territories, the indices show no change or a slight improvement over time.¶ ¶ The water quality index for the nation’s coastal waters is rated fair, with 55% of the nation’s coastal area rated good for water quality condition, 36% rated fair, and 6% rated poor.

#### Ocean conditions are already improving in places like Oregon

Milstein 08 (Michael, public affairs officer at the Bonneville Power Administration, which markets power from hydroelectric dams on the Columbia River system and funds one of the largest fish and wildlife protection programs in the country. He was formerly an environment and science reporter at The Oregonian in Portland, Ore., where he covered natural resource issues.public affairs officer at the Bonneville Power Administration, which markets power from hydroelectric dams on the Columbia River system and funds one of the largest fish and wildlife protection programs in the country. He was formerly an environment and science reporter at The Oregonian in Portland, Ore., where he covered natural resource issues.freelancer, writing for High Country News and Air & Space, the Los Angeles Times, The Boston Globe, The Washington Post, The San Diego Union-Tribune, Astronomy, Earth and others, “Oregon ocean conditions best for fish in 50 years”, 12/19/08, The Oregonian, <http://www.oregonlive.com/environment/index.ssf/2008/12/ocean_conditions_best_for_fish.html>)

After several years of poor ocean conditions that left birds starving and fish dwindling, this year brought a healthy influx of cold, nutrient-rich water along the Oregon Coast that likely represent the best year for fish in decades, scientists say.¶ Surveys along the coast from Newport north to LaPush, Wash., found more juvenile chinook salmon than they've seen in the 11 years the surveys have been done, researchers said.¶ That suggests that the Northwest could see a salmon boom once those fish mature and migrate back to their home rivers in the next few years.¶ That would represent a welcome contrast to the last few years.¶ The key to ocean productivity off the Oregon Coast is upwelling of deep, cold water that is rich in nutrients. The water typically nurtures rich marine ecosystems, but last year and in the few years before the upwelling has happened erratically and hasn't provided the nutrients essential to fish and other coastal life.¶ Scientists believe that the return to positive conditions may be connected with the Pacific Decadal Oscillation, a climate pattern that shifts between warm and cool cycles in periods of 20 to 30 years. This year, the pattern was cooler than it has been since 1955, said Bill Peterson, a NOAA-Fisheries biologist based in Newport who is also affiliated with Oregon State University's College of Oceanic and Atmospheric Sciences.¶ "We usually see cold water conditions for a few months once upwelling begins in late spring and early summer," Peterson said in an OSU press release. "Since April of 2007, though, we've been in a constant 'summer-state' ocean condition, which is something we've never seen in more than 20 years of sampling. And we're not sure why."¶ The conditions nurture masses of phytoplankton that are rich in fat and provide food for small fish such as anchovies and herring, which themselves become food for salmon and other predators. The word from researchers this year was that seabirds were getting plenty to eat and that it was a good year for ling cod and other rockfish.

### U: Air Pollution Low Now

#### The environment is recovering in the squo

Stallard 14

By [Brian Stallard](http://www.natureworldnews.com/reporters/brian-stallard) writer for nature world news Jun 26, 2014 04:34 PM EDT “Satellite Images Show That US Air Quality Is Actually Improving” <http://www.natureworldnews.com/articles/7790/20140626/satellite-images-show-air-quality-actually-improving.htm> (Merkley)

You may not have noticed, but if you've been living in a major US city for the past decade, your quality of air has actually been improving. New Images out from NASA satellites show this significant reduction in air pollution levels in a series of striking photographs released this week. "After ten years in orbit, the Ozone Monitoring Instrument (OMI) on NASA's Aura satellite has been in orbit sufficiently long to show that people in major U.S. cities are breathing less nitrogen dioxide - a yellow-brown gas that can cause respiratory problems," the space agency reported in a recent [press release.](http://www.nasa.gov/content/goddard/new-nasa-images-highlight-us-air-quality-improvement/index.html) According to NASA, Nitrogen dioxide is a common pollutant that falls under strict regulation by the United States Environmental Protection Agency (EPA) as it is considered a significant threat to human health. Like many major air pollutants in the US, the gas comes primarily from combustion engines and coal power plants. Remarkably, NASA points out that levels of Nitrogen Dioxide have decreased - especially along the East Coast where it was most concentrated - even while the number of cars on US roads has increased.

### U: Sea Otters Strong Now

#### **The California sea otter population is improving**

Otter Project 8 – Otter Project, 501(c)3 nonprofit organization dedicated to the recovery of the California sea otter, “California Sea Otter Population Condition IMPROVING,” 2/11, http://www.otterproject.org/wp-content/uploads/2012/06/20080211\_PR\_Sea\_otter\_status.pdf

The condition of the California sea otter population appears to be improving according to a comprehensive evaluation of government statistics compiled by The Otter Project. “This is good news!,” said Steve Shimek, executive director. Every year, The Otter Project compiles data on population condition and reports those numbers on its web site and to officials. In 2007, two of the four measures were strongly up, one neutral, and one down. The final statistics for 2007 became available in January. The Otter Project evaluates four population measures: spring count, dead strandings, pup counts, and mortality by age class. The 2007 spring sea otter count was 3026, up 12-percent from 2006 (although the report cautions that single year count statistics are dependent on counting conditions and can be misleading). Although the number of dead strandings was up, it was proportional to the population increase. The proportion of dead strandings was level for the fourth year in a row and has not increased as reported by some organizations in efforts to raise money. The Otter Project evaluates mortality by age class for the past year compared to historical average. “In a perfect world, sea otters would be born and live to old age; it appears there may have been increased pup death in 2007,” said Shimek. But the statistics also show moderate increases in the number and proportion of pups since 2003. “Otters are far from “out of the seaweed” yet, we only have 3000 otters where there was once around 12,000 to 16,000,” said Shimek, “But this is great news, for the first time in several years, the trends seem up instead of down.”

### U: Fish Strong Now

#### **Fish conditions, especially salmon conditions, are improving along the California coast – but any fluctuations could devastate them**

Peterson 8 - Bill, NOAA Fisheries headquarters, where he served for three years as the Director of the U.S. GLOBEC Interagency Program Coordination Office, California Sportfishing Protection Alliance, "Oregon scientists report ocean conditions improving for juvenile Chinook salmon," 12/30, http://www.calsport.org/12-30-08c.htm

December 30, 2008 -- NEWPORT, Ore. – Ocean conditions during 2008 for many fish species in the Pacific Northwest, including chinook salmon, were greatly improved because of a huge cold water influx that settled in across much of the northern Pacific Ocean – a phenomenon not seen on this scale in years. In fact, scientists who surveyed near-shore waters from Newport, Ore., to LaPush, Wash., this year found the highest numbers of juvenile chinook salmon they’ve encountered in 11 years of sampling. The reason may be traced to the Pacific Decadal Oscillation, a pattern of climate variability that historically has shifted between warm ( positive ) and cool ( negative ) regimes over cycles of 20 to 30 years. During 2008, the PDO was the most negative it has been since 1955, according to Bill Peterson, a NOAA fisheries biologist at Oregon State University’s Hatfield Marine Science Center. “We usually see cold water conditions for a few months once upwelling begins in late spring and early summer,” said Peterson, who has a courtesy appointment in OSU’s College of Oceanic and Atmospheric Sciences. “Since April of 2007, though, we’ve been in a constant ‘summer-state’ ocean condition, which is something we’ve never seen in more than 20 years of sampling. And we’re not sure why.” Strong, continual upwelling has fueled phytoplankton growth that forms the basis of the marine food web. Cold water has drawn a huge biomass of northern copepods from the Gulf of Alaska, and these zooplankton species have high fat reserves that provide a rich diet for anchovies, herring and other baitfish, which in turn become prey for salmon, ling cod and other creatures. “The ocean is thick with these large copepods, which accumulate fat as a way to survive the winter,” Peterson said. “When the Pacific Decadal Oscillation is in a positive phase and warmer water moves into the coast from offshore and the south, the copepods we see are species that are smaller and don’t retain lipids.” Peterson said anecdotal evidence from other researchers at OSU’s Hatfield Marine Science Center suggests that recruitment for juvenile ling cod and other rockfish was extraordinary in 2008. Seabirds, including pelicans and a large murre colony at Yaquina Head, were healthy and well-fed. And there was a large population of sand lances – a small baitfish that feeds on copepods. If there is a downside, Peterson says, it is that the survey didn’t find as many juvenile coho salmon in 2008 as the scientists had hoped. The number of juvenile chinook, on the other hand, was 2.4 times higher than any other survey recorded in the past 13 years, Peterson said. The scientists used an array of nets in their survey, including a trawling net as tall as a five-story building and as wide as half a football field. Though 2008 has been a banner year for ocean conditions – and many fish species – it is too early to know what the future holds for ocean conditions or fish runs. The Pacific Decadal Oscillation has been shifting more rapidly between warm and cool phases, possibly in response to climate change. A positive phase, characterized by warm, less-salty water, occurred from 1925 to 1947, followed by a negative phase of cooler, saltier water from 1948 to 1976. Then another positive phase took over and lasted through the powerful El Nino of 1998.

# Links

## Algae Biofuels

### Algae Biofuels 1NC

#### Growing and converting algae more harmful to environment than other biofuel alternatives

Katie Howell 10 (Scientific American, “Is Algae Worse than Corn for Biofuels?”, Jan 22, 2010, <http://www.scientificamerican.com/article/algae-biofuel-growth-environmental-impact/>)

Growing algae for use in biofuels has a greater environmental impact than sources such as corn, switch grass and canola, researchers found in the first life-cycle assessment of algae growth.¶ Interest in algae-based biofuels has blossomed in the past year, sparking major investments from Exxon Mobil Corp. and Dow Chemical Co., and it has gained steam on Capitol Hill, as well. But the nascent industry has major environmental hurdles to overcome before ramping up production, according to research published this week in Environmental Science and Technology.¶ "What we found was sort of surprising," said Andres Clarens, a civil and environmental engineering professor at the University of Virginia and lead author of the paper. "We started doing this with as much optimism as everybody else."¶ Algae production consumes more energy, has higher greenhouse gas emissions and uses more water than other biofuel sources, like corn, switch grass and canola, Clarens and his colleagues found by using a statistical model to compare growth data of algae with conventional crops.¶ "From a life-cycle standpoint, algae are not nearly as desirable as you would think they are," Clarens said. "And that was surprising to us."¶ The culprit, the researchers say, is fertilizer. Growing algae in open ponds is akin to producing them in a shallow swimming pool, Clarens said, so all of the nutrients -- nitrogen and phosphorus -- needed to keep them alive and boost their production come from outside sources.¶ And that fertilizer has an environmental impact because it's often made from petroleum feedstocks, Clarens said.¶ "If you grow corn, you rotate the field with soybeans so you get nitrogen fixation," Clarens said. "You still have to fertilize a lot, but if you're growing algae ... all that fertilizer has to come from you, and the fertilizing demands are much higher."¶ Carbon dioxide also contributes to algae's environmental footprint. Algae use sunlight and water to convert carbon dioxide into materials that can be easily converted into fuel. But that CO2 has to come from somewhere, Clarens said. And until it's economical to pull it out of coal-fired power plant smokestacks or other industrial sources, it comes from petroleum-based sources, as well.¶ Algae production has some other negative environmental impacts, Clarens said. For one, to convert algae into fuel, producers centrifuge the algae-laden water to separate the two, and that takes "a fair amount of energy," Clarens said.¶ But Clarens and his colleagues aren't writing off algae as a potential future energy source.¶ "We wanted to point to areas where algae performs poorly so we'll have a bit of a road map if we do decide to go down the algae road," Clarens said.¶ The algae industry has called for life-cycle assessments and is working on its own complete analysis, Mary Rosenthal, executive director of the Algal Biomass Organization, said in an e-mailed statement. She said her organization had not had time to fully review the paper and could not comment on it specifically.¶ "However, in general, the Algal Biomass Organization firmly believes life cycle assessments are critical to the development of the industry, given the need to accurately assess and quantify the environmental impact of algae-derived energy," she said. "Our membership supports the development of robust [life-cycle assessments], but believes that the process should include input from a multitude of stakeholders, including algae technology companies, [nongovernmental organizations] and other scientists."¶ The data used in Clarens' study came from previously published work about algae growth demonstrations since the 1980s, he said.

### Algae Biofuels 2NC

#### Algae biofuels prove harmful to environment at best due to petroleum used in conversion

Luke Geiver 11 (Associate Editor with Biodiesel Magazine andBiorefining Magazine.   bachelor’s degree in English from South Dakota State University and a master’s degree in English from the University of North Dakota. “The (Bad) Case for Algae?”, September 08, 2011, Biodiesel Magazine, <http://www.biodieselmagazine.com/articles/8042/the-bad-case-for-algae>)

It might be a cliché, but the old saying “it takes money to make money” still applies to algae—sort of. A research team from the University of Virginia has completed a study, “Environmental Impacts of Algae-Derived Biodiesel and Bioelectricity for Transportation,” which indicates that although algae-based biodiesel may be more energy intense than a canola or switchgrass alternative, the end result of using algae-based energy will always be linked to the idea that it takes petroleum to make petroleum energy replacements. Unfortunately, that link, as the study shows, means that algae can have a greater negative impact on the environment because of the petroleum required to turn algae cultures into algae fuels. “This suggests,” the study states, “that both cultivation and conversion processes must be carefully considered to ensure the environmental viability of algae-to-energy processes.”¶ One of the researchers who worked on the study, Lisa Colosi, assistant professor of civil and environmental engineering at the university, might have put the entire study into the best perspective possible. Colosi says that it all comes down to “value-driven questions.” As she puts it, “Do we value driving long distances in SUVs that require a lot of fuel? If so, we need to look at algae so we can produce as much fuel as possible.”

#### Algae biofuels leave behind big environmental footprint

Eric Wesoff 10 (Senior Analyst GTM Research, “Algae Cultivation: Worse Carbon Footprint Than Corn”, January 26, 2010, Green Tech Media, http://www.greentechmedia.com/articles/read/Algae-Cultivation-Worse-Carbon-Footprint-Than-Corn)

¶ Algae biofuel production "consumes more energy, has higher greenhouse gas emissions and uses more water than other biofuel sources, such as switchgrass, canola and corn," according to a University of Virginia study published in Environmental Science & Technology.¶ ¶ Here's an extract from the abstract: ¶ ¶ Algae are an attractive source of biomass energy since they do not compete with food crops and have higher energy yields per area than terrestrial crops. In spite of these advantages, algae cultivation has not yet been compared with conventional crops from a life cycle perspective. In this work, the impacts associated with algae production were determined using a stochastic life cycle model and compared with switchgrass, canola, and corn farming. The results indicate that these conventional crops have lower environmental impacts than algae in energy use, greenhouse gas emissions, and water regardless of cultivation location. Only in total land use and eutrophication potential do algae perform favorably.¶ ¶ Biofuels Digest makes the supporting data available for free here.¶ ¶ The findings of this study point out the inherent water and nutrient issues confronting algae biofuel farmers. ¶ ¶ “The large environmental footprint of algae cultivation is driven predominantly by upstream impacts,” according to the paper, “such as the demand for CO2 and fertilizer. To reduce these impacts, flue gas and, to a greater extent, wastewater could be used to offset most of the environmental burdens associated with algae."¶ ¶ It would imply that companies relying on Photobioreactors (PBRs) and non-waste water feedstock are going to have the wrong carbon footprint. And there remain many challenges associated with the use of flue gas, as well.

#### Creating algae biofuels involves using “dirty” sources and is ultimately unsustainable-funds would be better used on other clean alternatives

Energy Justice Network 12 (“Algae Biofuels”, 10/24/12, http://www.energyjustice.net/biodiesel/algae)

Algae biofuels have been explored for decades, with more attention in the past decade. Fundamental problems keep it from making sense... mainly the need for a concentrated CO2 source and large amounts of water and nutrients (nitrogen and phosphorous).¶ One problem with commercially producing biodiesel from algae is that it needs a concentrated and plentiful CO2 source. This requires hitching this "green" industry to dirty pollution sources that ought to be rapidly phased out, such as coal power plants. This marriage of algae biodiesel to coal has resulted in such public relations articles with titles like "Algae - like a breath mint for smokestacks. To obtain a purified CO2 source from power plant exhaust, massive amounts of investment dollars would need to be spent on "clean coal" gasification systems – perpetuating coal use (and the related destruction from mining, burning and waste disposal). Such money would go much further if invested in genuine clean energy strategies.¶ To make the industry commercially viable, researchers have pursued biotech varieties, which could be particularly dangerous if released into nature. Some algae biodiesel proposals involve aquaculture-style operations in open ocean waters, which could have harmful ecological effects, especially if biotech algae is used.¶ Water and nutrient use would also be extreme, making any serious scaling up of algae biofuels quite unsustainable.¶ The National Research Council of the National Academy of Sciences has explored this in a 2012 report called "Sustainable Development of Algal Biofuels," which found the following:¶ Biofuels made from algae are gaining attention as a domestic source of renewable fuel. However, with current technologies, scaling up production of algal biofuels to meet even 5 percent of U.S. transportation fuel needs could create unsustainable demands for energy, water, and nutrient resources. Continued research and development could yield innovations to address these challenges, but determining if algal biofuel is a viable fuel alternative will involve comparing the environmental, economic and social impacts of algal biofuel production and use to those associated with petroleum-based fuels and other fuel sources. This report was produced at the request of the U.S. Department of Energy.

## Aquaculture

### Aquaculture 1NC

#### Open ocean aquaculture undermines marine environment --- fish escapes and spread of waste and chemical byproducts

Wheeler, 13 --- J.D. Candidate 2013, Golden Gate University School of Law (Spring 2013, Garrett Wheeler, Golden Gate University Environmental Law Journal, “COMMENT: A FEASIBLE ALTERNATIVE: THE LEGAL IMPLICATIONS OF AQUACULTURE IN THE UNITED STATES AND THE PROMISE OF SUSTAINABLE URBAN AQUACULTURE SYSTEMS,” 6 Golden Gate U. Envtl. L.J. 295, JMP)

III. ENVIRONMENTAL PROBLEMS ASSOCIATED WITH AQUACULTURE

In the past decade, a new wave of industrial and governmental enthusiasm for ocean-based operations, particularly for offshore farms located in the 200-mile wide Exclusive Economic Zone (EEZ), n34 has [\*300] garnered attention as well as controversy. n35 Proponents n36 view open-ocean farms as playing a major role in solving the United States' $ 9 billion seafood trade deficit, n37 while opponents n38 warn of potentially devastating economic, social, and environmental consequences. n39

New technologies are allowing operators to cultivate fish and other seafood in exposed, open-ocean environments that were inaccessible only twenty years ago. n40 However, the rise of offshore aquaculture poses significant threats to sensitive marine environments and "represents a fundamental transition in the human claim on the Earth's surface." n41

Open-ocean aquaculture facilities operate in largely pristine areas and are intimately connected with their surrounding aquatic ecosystems. n42 Common species cultivated in the open ocean include mostly finfish such as salmon, cod, and tuna. n43 Large underwater cages are placed in the water, and as ocean currents flow through the cages, the spread of waste and chemical byproducts can implicate the health of the seafloor and the surrounding water column. n44 Escaped fish also pose a [\*301] threat to marine ecosystems by introducing non-indigenous species, compromising the genetic fitness of native populations through interbreeding, and disease translocation. n45 Disease and parasites may also spread to nearby native populations, and attempts by operators to apply drugs and chemicals to contain those threats can damage the surrounding ecosystem. n46 Predatory fish and marine mammals are also drawn to cages full of captive fish, leading to injury, death, and harassment by operators trying to protect their stocks. n47 Finally, operational failures are all but inevitable: in at least one instance, an entire fish cage broke free from a tow vessel and was sent floating adrift in the open ocean, endangering marine species as well as any ocean-going vessels unfortunate enough to cross its path. n48

Compared to the negative environmental impacts of ocean-based aquaculture facilities, the negative impacts of land-based systems are easily minimized. Unlike ocean-based operations, isolated terrestrial facilities have fewer problems with escapement. n49 The spread of disease is also easier to control because fecal matter and feed waste are not in direct contact with the surrounding marine ecosystem.

## Desalination

### Desal: General 1NC

#### Desalinization kills the environment

Scientific American 09

"The Impacts of Relying on Desalination for Water." Scientific American Global RSS. N.p., n.d. Web. 24 June 2014. <http://www.scientificamerican.com/article/the-impacts-of-relying-on-desalination/> The leading source and authority for science, technology information and policy for a general audience “The Impacts of Relying on Desalination for Water“(Merkley)

Due to its high cost, energy intensiveness and overall ecological footprint, most environmental advocates view desalinization (or desalination)‚ the conversion of salty ocean water into fresh water‚ as a last resort for providing fresh water to needy populations. Sourcing fresh water from streams, rivers, lakes and underground aquifers and adhering to strict water conservation measures are much more viable for both economic and environmental reasons in most situations, although some desert regions with thirsty and growing populations may not have many such options. The relationship between desalinization and climate change is complex. Global warming has increased droughts around the world and turned formerly verdant landscapes into near deserts. Some long held fresh water sources are simply no longer reliably available to hundreds of millions of people around the world. Meanwhile, expanding populations in desert areas are putting intense pressure on existing fresh water supplies, forcing communities to turn to desalinization as the most expedient way to satisfy their collective thirst. But the process of desalinization burns up many more fossil fuels than sourcing the equivalent amount of fresh water from fresh water bodies. As such, the very proliferation of desalinization plants around the world‚ some 13,000 already supply fresh water in 120 nations, primarily in the Middle East, North Africa and Caribbean, is both a reaction to and one of many contributors to global warming. Beyond the links to climate problems, marine biologists warn that widespread desalinization could take a heavy toll on ocean biodiversity; as such facilities' intake pipes essentially vacuum up and inadvertently kill millions of plankton, fish eggs, fish larvae and other microbial organisms that constitute the base layer of the marine food chain. And, according to Jeffrey Graham of the Scripps Institute of Oceanography's Center for Marine Biotechnology and Biomedicine, the salty sludge leftover after desalinization for every gallon of freshwater produced, another gallon of doubly concentrated salt water must be disposed of can wreak havoc on marine ecosystems if dumped willy-nilly offshore. For some desalinization operations, says Graham, it is thought that the disappearance of some organisms from discharge areas may be related to the salty outflow. Of course, as supplies of fresh water dwindle, the economic cost of desalinization‚ especially in coastal areas with easy access to ocean water‚ begins to look competitive with traditional water sourcing. To date there are about 300 desalinization plants in the United States, with 120 in Florida and less than 40 each in Texas and California. Some 20 additional plants are planned for the coast of California in the coming years, unless environmentalists extolling the virtues of conservation and wielding low-flow shower heads and toilets prevail.

### Desal: General 2NC

#### Desalination in oceans devastates ecosystems – Poseidon Resources proves

Boxall 13 – Bettina, reporter for LA Times, "Proposed desalination plant could harm ocean environment, report says," 11/10, http://articles.latimes.com/2013/nov/10/local/la-me-desal-huntington-20131111

Poseidon Resources, a small, privately held company based in Stamford, Conn., first proposed the Huntington Beach desalter, and a similar one now under construction in Carlsbad in San Diego County, in 1998. Both would be the largest seawater-to-drinking-water operations in the country, each producing enough purified water every year to supply roughly 100,000 households. Poseidon intended to avoid the expense and environmental problems of building and operating ocean intake and discharge systems by locating its facilities next to power stations and tapping into the huge volumes of seawater used to cool the generating equipment. But that strategy ran into hurdles in 2010 when the State Water Resources Control Board directed most coastal generating stations to phase out seawater cooling, which every year kills massive amounts of plankton at the bottom of the marine food web along with billions of fish eggs and larvae. When the AES Huntington Beach Generating Station on Pacific Coast Highway switches to a different cooling system within the next five years, Poseidon's proposed plant would continue using the power operation's offshore outfall and open ocean intake pipe, pulling in about 127 million gallons of coastal water every day. The commission staff estimates that would annually suck in more than 80 million fish larvae, eggs and invertebrates along 100 miles of the Southern California coast, including a number of Marine Protected Areas. Poseidon could largely avoid such harm, the staff says, by constructing intakes, called infiltration galleries, just below the ocean floor that imperceptibly draw seawater through a few feet of sand into perforated pipes, keeping out the tiny organisms that form the foundation of marine life. Company officials argue that infiltration galleries have been used only by much smaller desalination plants around the world and are unproven and prohibitively expensive for operations the size of Huntington Beach. If the commission adopts the staff recommendations, it would kill the Huntington Beach project and set "a terrible precedent that would have a chilling effect on seawater desalination in California," said Poseidon Vice President Scott Maloni. Far from being environmentally benign, he said subsurface intakes would require the excavation of more than 60 acres of seabed as well as the installation of beach pumping equipment, and would use more energy than an open ocean intake. The commission staff also says Poseidon needs to cut salinity levels of the brine that is left over from the desalting process and dumped back into the ocean. Poseidon intends to dilute the hyper-saline brine with a portion of the intake water. But the staff contends the diluted discharge would still be salty enough to hurt marine life.

#### Variety of adverse side effects on marine ecosystems, especially invertebrates

Lattemann 5 – Sabine, Diplom (MSc) Marine Environmental Science Carl von Ossietzky University Oldenburg, Germany Thesis: Marine Impacts of Seawater Desalination Plants; Postgraduate Diploma in Marine Science Otago University, Dunedin, New Zealand Thesis: Development of a teaching unit for the New Zealand Marine Studies Centre on the ENSO phenomenon; Vordiplom (BSc) Marine Environmental Science Carl von Ossietzky University Oldenburg, Germany, “Potential Impacts of Seawater Desalination,” 2005, http://www.paua.de/Impacts.htm

Salinity, temperature and density Salinity is increased in the waste stream of all processes, but elevated temperature values are characteristic of distillation plant effluents only. The RO brine has a higher density than seawater as a result of its increased salinity and will mostly affect benthic communities, while distillation plant discharges tend to float on the surface and interfere with productivity in the pelagic community. The positive buoyancy of distillation plant discharges is mostly due to the discharge of large volumes of cooling water, which are blended with the brine. 5 back to top Deaeration and oxygen scavengers With increasing temperature and salinity, oxygen becomes less soluble in seawater. However, oxygen levels are deliberately reduced in distillation plants by physical deaeration and addition of oxygen scavengers like sodium bisulfite to inhibit corrosion. Oxygen depletion is also a problem of the RO brine, as sodium bisulfite is commonly used as a neutralizing agent for chlorine. The lack of dissolved oxygen could be toxic to marine organisms and aeration is recommended prior to oceanic discharge. Chlorine One major pollutant of distillation processes is chlorine, which is added to the desalination plant feedwater to prevent biofouling on heat exchanger surfaces. In RO plants, chlorine is also a common biocide but modern plants often operate on polyamide membranes, which are sensitive to oxidizing chemicals such as chlorine. Neutralization is typically required before the feedwater enters the RO unit and it can be assumed that the brine is free from chlorine, too. Chlorine is a strong oxidant and highly effective biocide. Residual levels in the discharge may therefore be toxic to marine life in the discharge site. The use of chlorine also leads to the formation of oxidation by-products such as halogenated organics. These compounds are usually rather persistent in the marine environment and sufficient evidence exists that some of them are carcinogenic to animals. Due to environmental and health problems caused by residual chlorine and disinfection by-products, several alternative pretreatment methods have been considered to replace chlorine in desalination plants. Alternative biocides include for example ozone and monochloramine, while disinfection with ultraviolet light may be used instead of biocides to eliminate micro-organisms. Heavy metals The waste brine often contains low amounts of heavy metals that pass into solution when the plant's interior surfaces corrode. Brine metal composition depends on the use of different construction materials in distillation and reverse osmosis plants: Copper contamination is a major problem of distillation plants, as copper-nickel alloys are common materials for heat exchanger surfaces. In contrast, non-metal equipment and stainless steels are typically used in RO plants. The RO brine may therefore contain traces of iron, nickel, chromium and molybdenum, but contamination levels are generally low. Heavy metals tend to enrich in suspended material and finally in sediments, so that areas of restricted water exchange and soft bottom habitats could be affected by heavy metal accumulation. Many benthic invertebrates feed on this suspended or deposited material, with the risk that metals are enriched in their bodies and passed on to higher trophic levels. It is therefore recommended that limits are established for heavy metal concentrations in the brine discharges. Antiscalants Scaling on heat exchanger surfaces, inside tubes, or on RO membranes impairs plant performance. Antiscalants are commonly added to the feedwater in both distillation and RO plants to prevent scale formation. The main representatives of antiscalants are organic, carboxylic-rich polymers such as polyacrylic acid and polymaleic acid. Acids and polyphosphates are still in use at a limited scale but on the retreat. As antiscalants have a low toxicity, the acute environmental risk associated with their release into the marine environment is relatively low. Due to a poor degradability, however, dispersal and relatively long residence times must be expected, during which interference with element cycles of trace metals is a possible risk. Coagulants and coagulant aids Coagulants like ferric- or aluminum chloride are used to improve filtration of suspended material from the RO feedwater. Coagulant aids (organic substances with high molecular masses that bridge particles further together) and pH control are supplementary methods to enhance coagulation. The filter backwash can be discharged to the sea, as toxic effects are not expected by coagulants and coagulant aids. However, possible impacts such as reduced primary production or burial of sessile organisms by increased turbidity in the discharge should be anticipated. For impact mitigation, the backwash could be diluted, e.g. by continuous blending with the brine, or alternatively it could be removed from the filters and transported to a landfill. Antifoaming agents To reduce foaming in distillation plants, antifoaming agents like polyglycols are added to the feedwater, which are not toxic but poorly biodegradable. Adverse effects are not to be expected with regard to a low dosage level and sufficient dilution following discharge. Cleaning chemicals Cleaning intervals have to be established for each desalination plant individually and are typically three to six months depending on the quality of the plant's feedwater. In RO plants, alkaline cleaning solutions (pH 11-12) are used for removal of silt deposits and biofilms, whereas acidified solutions (pH 2-3) remove metal oxides and scales. Further chemicals are often added to improve the cleaning process of RO membranes, such as detergents, oxidants, complexing agents or biocides for membrane disinfection. In distillation plants, cleaning is typically very simple: Copper-nickel heat exchanger surfaces are washed with acidified warm seawater to remove alkaline scales. The acidic solution often contains a chemical inhibitor which is added to protect the plant from corrosion. Most of the named cleaning and disinfection chemicals may be hazardous to aquatic life, so that disposal to the ocean should be strictly regulated. Neutralization of the extremely alkaline or acidic solutions and treatment of additional cleaning agents is recommended before discharge to the ocean to remove any potential toxicity.

#### Ocean desal plants suck in billions of fish and organisms

Food & Water Watch 9 – nonprofit consumer organization that works to ensure clean water and safe food, “Desalination: An Ocean of Problems,” February, http://documents.foodandwaterwatch.org/doc/Desal-Feb2009.pdf

Ocean desalination plants can wreak havoc on marine life and commercial fisheries. Many proposed coastal plants rely on power plants to pull in ocean water. These power plants use outdated “once-through cooling water intake structures” that cool the plants by pulling in large quanti-ties of seawater. Desalination plants located next to these facilities take a portion of the outgoing water from these systems for their water supply. The problem here is that these structures suck in a lot more than seawater — they also bring marine life that dies in the machinery. According to EPA, these intake structures kill at least 3.4 billion fish and other organisms annually. Larger organisms are trapped against the intake screens, and smaller ones, such as fish eggs and larvae, are drawn through the intake screens and destroyed in the cooling sys-tem.

#### Desalinization disrupts ocean environment

Block ND

<http://www.worldwatch.org/node/5720> Ben Block is a staff writer with the [Worldwatch Institute](http://www.worldwatch.org/) who covers everything environmental for Eye on Earth and previously led outreach efforts for the Verified Carbon Standard Association, a greenhouse gas accounting program used by projects around the world to verify and issue carbon credits in voluntary markets. He managed the organization's online presence, implementation of an enterprise-wide CRM system, production of marketing and press outreach materials, enforcement of trademark rights, coordination of stakeholder inquiry responses, and approval of select greenhouse gas accounting methodologies. “Desalination Raises Environmental, Cost Concerns” (Merkley)

As global freshwater reserves dry up, desalination plants are receiving greater attention as an option for providing both drinking water supplies and agricultural irrigation. But a [new study](http://www.nap.edu/catalog.php?record_id=12184) released on Thursday raises several concerns about the environmental impact and cost effectiveness of the widely touted technology to convert seawater to fresh water. Desalination plants pose a risk to marine species when the water is collected from ocean areas, as well as when the salty discharge is deposited into coastal estuaries, according to the report, which was released by the U.S. [National Research Council](http://sites.nationalacademies.org/nrc/index.htm) (NRC). Also, current desalination technology often does not adequately remove the chemical element boron, which occurs naturally in seawater and is considered toxic to humans, the report said.

### Desal: Warming DA 1NC

#### Ocean desalination increases warming

Food & Water Watch 9 – nonprofit consumer organization that works to ensure clean water and safe food, “Desalination: An Ocean of Problems,” February, http://documents.foodandwaterwatch.org/doc/Desal-Feb2009.pdf

Every step of reverse osmosis, from the water intake to the high-pressure pumps, transport and waste disposal systems, requires large amounts of energy. In addition, the saltier the source water, the more energy required to remove the salt. Seawater is the most concentrated source water solution there is, which means that ocean desalina-tion is the most energy intensive desalination process. Based on cost estimates from the National Research Council report,42 seawater desalination in California takes nine times as much energy as surface water treatment and 14 times as much energy as groundwater produc-tion.\* Meanwhile, very few desalination plants use renew-able energy sources. Surfrider Foundation and San Diego Coastkeeper estimated that a 53 million gallon-per-day de- salination plant would cause nearly double the emissions of treating and reusing the same amount of water.43 Ironically, these emissions contribute to global climate change, which will only quicken the droughts and water shortages that de-salination is supposed to help us avoid.

### Desal: Warming DA 2NC

#### Increases warming – California proves

Food & Water Watch 9 – nonprofit consumer organization that works to ensure clean water and safe food, “Desalination: An Ocean of Problems,” February, http://documents.foodandwaterwatch.org/doc/Desal-Feb2009.pdf

Ironically, while desalination is supposed to improve water shortages, its emissions could actually hasten the global warming that will alter precipitation patterns and further strain existing water supplies. The greenhouse gas pollution from the industrial seawater desalination plants dwarfs emissions from other water supply options such as conservation and reuse. Seawater desalination in California, for example, could consume nine times as much energy as surface water treatment and 14 times as much energy as groundwater production.

### Desal: Fisheries DA

#### Desal plants devastate fisheries

Food & Water Watch 9 – nonprofit consumer organization that works to ensure clean water and safe food, “Desalination: An Ocean of Problems,” February, http://documents.foodandwaterwatch.org/doc/Desal-Feb2009.pdf

Ocean desalination plants can wreak havoc on marine life and commercial fisheries. Many proposed coastal plants rely on power plants to pull in ocean water. These power plants use outdated “once-through cooling water intake structures” that cool the plants by pulling in large quanti-ties of seawater. Desalination plants located next to these facilities take a portion of the outgoing water from these systems for their water supply. The problem here is that these structures suck in a lot more than seawater — they also bring marine life that dies in the machinery. According to EPA, these intake structures kill at least 3.4 billion fish and other organisms annually. Larger organisms are trapped against the intake screens, and smaller ones, such as fish eggs and larvae, are drawn through the intake screens and destroyed in the cooling sys-tem. As a result, fishermen lose at least 165 million pounds of fish today and 717.1 million pounds of potential future catch. This is equivalent to a $212.5 million economic loss to anglers and commercial fishermen.56 California’s power plant intake structures alone are respon-sible for the destruction of at least 312.9 million organisms each year, resulting in the lost catch of at least 28.9 million pounds of fish and 43.6 million pounds of potential future catch. This amounts to a $13.6 million loss to fishermen.5

### Desal: Envt Justice DA

#### Ocean desal promotes social and environmental injustice

Food & Water Watch 9 – nonprofit consumer organization that works to ensure clean water and safe food, “Desalination: An Ocean of Problems,” February, http://documents.foodandwaterwatch.org/doc/Desal-Feb2009.pdf

Unfortunately, the costs of desalination get passed down to the consumer. For example, the California American Water Company demanded an up-front rate increase to construct its proposed plant in Monterey, California, be-fore it ever produced a drop of water.91 Across the country, in Brockton, Massachusetts, ratepayers expected to see an estimated 30 percent hike in their water rates once the city started buying desalinated river water.92 In 2008, the city council voted for a 60 percent increase in rates before the plant even came online.93 Such price hikes are not just a problem for individuals, but also for society. Water is a basic human need that must be available to all citizens, and most communities cannot afford to pay exorbitant prices for the desalted water. This means that ocean desalination contributes to social injustice, because the costs of rate hikes fall disproportionately on low-income communities.94 To add insult to injury, the people in these communities tend to be the same people who would be most likely to experience the negative effects from the plants. In California, for example, most proposed desalination plants would serve affluent communities in Marin County, the Monterey area, Cambria, southern Orange County and northern San Diego County.95 However, most of the proposed plants will be built in industrial areas, which tend to house low- income communities. These populations will experience the increased air pollution, noise and traffic that come from the plants. Meanwhile, low-income coastal communities that rely on subsistence fishing may be exposed to high levels of toxins in fish that are exposed to desalination waste products.97

### Desal: Nuclear 1NC

#### Construction of desalination system negatively affects ocean invertebrates.

IAEA 10 – International Atomic Energy Agency, serves as the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field, “ENVIRONMENTAL IMPACT ASSESSMENT OF NUCLEAR DESALINATION,” March, http://www-pub.iaea.org/MTCD/publications/PDF/te\_1642\_web.pdf

Normally the impact from constructing the intake system is temporary and limited to the construction area [49]. Its intensity will depend not only on the chosen intake system and method of construction, but also on the site location and bathymetry, biological activity and ecosystem richness, currents, tides and wave activity, and the site’s geological properties. This impact is mainly due to the increased turbidity that affects the photosynthetic process and sedimentation from the settling material. In that case, the benthic communities may suffer high mortality rates and inability to recover during the construction time in the affected area, the phytoplankton’s photosynthesis can be affected negatively and the nektonic species are likely to migrate out of it. This ecosystem deterioration can cause local fisheries to decline or even collapse. Studies of biological communities have shown that typically biological communities might need between one and three years to recover from the disturbances such as boat anchors [50]. Construction activities can affect much larger marine area, and depending on the measures taken to prevent such adverse impacts, the necessary time for ecosystem restoration can be even longer than three years.

### Desal: Nuclear 2NC

#### **Nuclear power plants on the oceans devastate fish larvae – Diablo Canyon proves**

IAEA 10 – International Atomic Energy Agency, serves as the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field, “ENVIRONMENTAL IMPACT ASSESSMENT OF NUCLEAR DESALINATION,” March, http://www-pub.iaea.org/MTCD/publications/PDF/te\_1642\_web.pdf

Out of those, Diablo Canyon NPP (Figure 9) is the only one that qualifies to be a nuclear desalination facility according to the IAEA definition [52], despite its small desalinating capacity ranging around 2180 m3 /d mainly used for cooling water make up. Built in the times when the adverse impacts of any power plant on the environment were largely unknown and overlooked, its seawater intake system with a seawater withdrawal of up to 9.5 million m3 /d [53] is situated in a coastal cove. Subsequently, researchers have estimated its attributed entrainment/impingement rate for five selected near-shore fish larvae to be from 10-30% with “potential dramatic effects on the local coastal environment” [44, 53]. The California Energy Commission analysis of the Diablo Canyon intake impact suggests that the larvae loss due to entrainment equals 120-240 hectares of rock reef habitat [40]. The methodology used to calculate these impacts is presented further (see Appendix I) and is considered as a proper tool although it is difficult to firmly ascribe changes in the marine organisms’ populations to a specific impact due to lack of knowledge on impact interactions.

#### **Courts and CA Coastal Commission agree that avoiding desalination is better than compensating**

IAEA 10 – International Atomic Energy Agency, serves as the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field, “ENVIRONMENTAL IMPACT ASSESSMENT OF NUCLEAR DESALINATION,” March, http://www-pub.iaea.org/MTCD/publications/PDF/te\_1642\_web.pdf

What is important to note in cases of compensatory mitigation efforts, is that a recent court decision in the USA prohibited the use of habitat restoration as a Section 316(b) compliance alternative [29]. Thus, the decision calls for avoiding environmental harm through technical solutions, rather than compensating for it. Furthermore, the proposed desalination plant in Carlsbad, California, has been repeatedly denied the building permit by the California Coastal Commission, due to refusal to apply the Best Available Technology for intake systems. The rejected plan calls on using the intake from the power plant where desalination plant should be co-located [30]. These two events will certainly influence nuclear desalination development in the USA, and as previously said, it is expected that similar approaches will be adopted in the near future in other countries, with similar effect on nuclear desalination.

## FNPP

### FNPP 1NC

#### A meltdown would cause global ocean pollution

**Durkin 12** (Claire, Stanford graduate, “Floating Nuclear Heat-and-Power Plants”) http://large.stanford.edu/courses/2012/ph241/durkin2/

The major safety concerns for floating plants center around the risks of a nuclear accident and subsequent radioactive contamination. When there is meltdown and primary containment has been breached, nuclear fuel may leach from the reactor's core into the surrounding environment. On land, the fuel's high heat would melt the surrounding earth to create a sort of insulation chamber. Contamination by the radioactive fuel would be localized to the region around the plant. If a meltdown were to occur over the ocean, widespread water contamination is likely. For example, the poisonous reactor core could melt through the floating barge into water below or boat damage could cause the plant to capsize. Oceanic contamination would be a global problem, rather than a local one. [9] Security and protection also is limited on the open seas, leaving the reactors vulnerable to terrorism and harsh environmental conditions, such as tsunamis.

### FNPP 2NC

#### FNPPs pose a serious threat to the environment-especially when placed in remote and unstable areas

Bellona 11 (“Floating nuclear power plants a dangerous and expensive project”, 4/26, http://bellona.org/news/nuclear-issues/accidents-and-incidents/2011-04-floating-nuclear-power-plants-a-dangerous-and-expensive-project#bio-1)

Accidents and incidents¶ Floating nuclear power plants a dangerous and expensive project¶ Russia’s floating nuclear power plant is an environmental time bomb, and production costs are going to be sky high, said Igor Kudrik, a Bellona expert on the Russian nuclear industry.¶ Published on April 26, 2011 by Bellona¶ ¶ “Russia’s plans for floating nuclear power plant represent enormous environmental and safety hazards**,** and the current from will be disastrously expensive, “said Kudrik.¶ Marking exactly 25 years since the Chernobyl accident, Bellona organized today a nuclear seminar where the organization’s new report was presented.¶ “The world’s first floating nuclear power plant is now being built in St. Petersburg, and will be completed in 2012. It is scheduled to become operational in the earthquake-prone Kamchatka Peninsula in the Far East of Russia.¶ Catastrophic location for floating reactors¶ Kamchatka is located near Japan, which since 11 March has fought for his life against the tsunami- and earthquake- triggered nuclear crisis at the Fukushima Daiichi nuclear power plant.¶ “The risk of serious accidents with severe consequences is always present at nuclear power plants. They are not exactly small when you set them to sea – and this in areas of high volcanic activity,” said Kudrik.¶ Floating plants helpless in an accident¶ Kudrik added that the plan is to use the floating nuclear power plants in remote areas with little electricity and infrastructure.¶ This is in and of itself a risk because there is no infrastructure that would make it easier to implement effective countermeasures in case of accidents.¶ Increased nuclear proliferation risks¶ The report also says that Russia has ambitious plans to sell its new floating power plants to countries in Asia, Africa and Latin America, increasing the danger that nuclear technology could fall into hostile hands, said Kudrik.¶ “Some of the states we are talking about is relatively stable politically. Others are more worrying in this respect,” he said.¶ According to the Russian state nuclear corporation Rosatom countries such as Tunisia, Morocco, Senegal, Namibia, India, China, Indonesia, Chile, Brazil and others are on the list of interested potential customers.¶ “Anyone who is concerned about non-proliferation, should be skeptical of the Russians’ plans,” said Kudrik.¶ Plans should be shelved¶ The report, written by Bellona’s Alexander Nikitin and Leonid Andreev, also contains information that gives reason to question why Russia would go ahead with the project at all. Each megawatt of installed production at these plants will cost $7.8 million.¶ For comparison, the same figure at the Olkiluoto nuclear power plant in Finland is $3.3 million.¶ “The economic of the project are simply miserable. There is not one single good reason to go ahead with this fluent madness, “said Kudrik.

#### Radioactivity from FNPPs would pollute Arctic-Russia proven unreliable in protecting environment

John Vidal 09 (“Russia to build floating Arctic nuclear stations”, The Observer, 2 May 2009, http://www.theguardian.com/world/2009/may/03/russia-arctic-nuclear-power-stations)

Polar Bear on Iceberg¶ Oil and gas in the Arctic are seen as ripe for exploitation by the Russian energy industry. ¶ Russia is planning a fleet of floating and submersible nuclear power stations to exploit Arctic oil and gas reserves, causing widespread alarm among environmentalists.¶ A prototype floating nuclear power station being constructed at the SevMash shipyard in Severodvinsk is due to be completed next year. Agreement to build a further four was reached between the Russian state nuclear corporation, Rosatom, and the northern Siberian republic of Yakutiya in February.¶ The 70-megawatt plants, each of which would consist of two reactors on board giant steel platforms, would provide power to Gazprom, the oil firm which is also Russia's biggest company. It would allow Gazprom to power drills needed to exploit some of the remotest oil and gas fields in the world in the Barents and Kara seas. The self-propelled vessels would store their own waste and fuel and would need to be serviced only once every 12 to 14 years.¶ In addition, designers are known to have developed submarine nuclear-powered drilling rigs that could allow eight wells to be drilled at a time.¶ Bellona, a leading Scandinavian environmental watchdog group, yesterday condemned the idea of using nuclear power to open the Arctic to oil, gas and mineral production.¶ "It is highly risky. The risk of a nuclear accident on a floating power plant is increased. The plants' potential impact on the fragile Arctic environment through emissions of radioactivity and heat remains a major concern. If there is an accident, it would be impossible to handle," said Igor Kudrik, a spokesman.¶ Environmentalists also fear that if additional radioactive waste is produced, it will be dumped into the sea. Russia has a long record of polluting the Arctic with radioactive waste. Countries including Britain have had to offer Russia billions of dollars to decommission more than 160 nuclear submarines, but at least 12 nuclear reactors are known to have been dumped, along with more than 5,000 containers of solid and liquid nuclear waste, on the northern coast and on the island of Novaya Zemlya.¶ The US Geological Survey believes the Arctic holds up to 25% of the world's undiscovered oil and gas reserves, leading some experts to call the region the next Saudi Arabia. But sea ice, strong winds and temperatures that can dip to below -50C have made them technologically impossible to exploit.¶ Russia, Norway, Denmark, Canada and the US have all claimed large areas of the Arctic in the past five years. Russian scientists used a mini-submarine to plant a flag below the North Pole in 2007 and have claimed that a nearby underwater ridge is part of its continental shelf.¶ Last week, ministers from many Arctic countries heard scientists and former US vice-president and Nobel prize winner Al Gore say that the Arctic could be free of ice in the summer within five years, with drastic consequences for the world's climate and human health.¶ But many countries bordering the Arctic see climate change as the chance to exploit areas that were once inaccessible and to open trade routes between the Pacific and Atlantic.¶ According to a new report by the Arctic Council, an intergovernmental forum, Russia is considering other nuclear plants for power-hungry settlements. "The locations that have been discussed include 33 towns in the Russian far north and far east. Such plants could be also used to supply energy for oil and gas extraction," says the report by the Arctic Monitoring and Assessment Programme.

#### FNPPs are uniquely vulnerable to accidents—no safety infrastructure

**Tveit 11** (Andreas, information adviser, 4/26/11, “Floating nuclear power plants a dangerous and expensive project” Bellona) http://www.bellona.org/articles/articles\_2011/FNPP\_chernobyl\_25

Kudrik added that the plan is to use the floating nuclear power plants in remote areas with little electricity and infrastructure. This is in and of itself a risk because there is no infrastructure that would make it easier to implement effective countermeasures in case of accidents.

#### Waste dumping turn

**Young 10** (Thomas, Research Associate at Monterey Institute of International Studies, 11/5/10, “Isolated Criticality: Russia's Floating Nuclear Power Plants, Concepts and Concerns” NTI) http://www.nti.org/analysis/articles/russias-floating-nuclear-power-plants/

The rationale for on-board storage and return to Russia of spent nuclear fuel (SNF) and nuclear waste is that the leasing nation does not have to dispose of the material itself, meaning there will be no justification for the development of reprocessing technology. This allows Russia to argue that the vessel will leave no radiological legacy and does not present a back-end proliferation risk -- something that has been used to market the technology abroad. [48] Despite these arguments, however, there are still concerns over the availability of space for spent fuel storage and the rate at which spent fuel can be transported to the Mayak reprocessing facility in Ozersk. Additional Russian storage facilities may have to be constructed, as the existing infrastructure was built to house SNF from decommissioned nuclear submarines and it is unclear whether this expense was factored into estimated production and operating costs.[49] This may result in limited storage capacity, raising concerns that radioactive waste will end up being dumped at sea in violation of the London Dumping Convention.[50] This is also true with regard to the limited storage capacity on-board the FNPP itself. Several analysts have voiced concern that if additional waste is produced, and it exceeds the storage capacity of the FNPP, then it may be dumped at sea.[51] Furthermore, if the vessel sinks with SNF and nuclear waste onboard then this radioactive material may be released into the surrounding marine environment. While the reactor will be housed in a containment structure, it remains unclear what safeguards have been put in place to prevent the release of waste materials.[52]

## FrankenFish

### Frankenfish 1NC

#### GE Salmon could cause extinction of salmon-also introduce disease

Food and Water Watch 10 (“FrankenFish: How Genetically Engineered Salmon Could Hurt our Health and Environment”, 9/2010, http://www.foodandwaterwatch.org/reports/frankenfish-issue-brief/)

GE Salmon’s Impact on Wild FishFrankenSalmon on the LamAquaBounty intends to sell GE salmon eggs to commercial farms to grow out to full size, claiming that these operators will raise fish in contained aquaculture facilities that limit the possibility of escape.18The potential impact from escaping GE salmon could be severe, with researchers suggesting that a small number of GE fish escapees could cause extinction of wild populations in as little as 40 generations.19Because of their competitive advantage as big, voracious fish, GE salmon could out-compete other wild fish for food and habitat. But the catch is that their own weak constitutions — not designed for the rigors of life outside of captivity — mean that the GE salmon may only last long enough in the wild to pre-vent natural populations from reproducing, leading to a total extinction of salmon in open waters.20AquaBounty’s promises to prevent escapes seem especially weak given the widespread problem of regular farmed salmon escapes from existing farms. In March of 2010, nearly 100,000 farmed Atlantic salmon escaped into the wild through one hole in a net at a UK fish farm.21Glob-ally, these numbers are much higher, with an estimated 2 million farmed salmon escaping into North Atlantic waters every yearwhile millions of others escape into the Pacific.23One biotech corporation doing experimental GE breeding in New Zealand is even suspected of accidentally releasing genetically modified salmon eggs into the wild demonstrating the logistical difficulties of preventing escapes, even in tightly controlled, experimental settings. AquaBounty, in the environmental assessment it submitted to the FDA, acknowledges, “No single containment measure can be assured of 100% effectiveness.”25Elsewhere in GE food production, such as with soybeans and corn, industry promises have failed to keep control of genetically engineered traits, causing enormous disruptions in international food markets. The U.S. Government Ac-countability Office found six known unauthorized releases of GE crops from the United States by 2008.26As just one example, in August 2006, the U.S. Department of Agriculture admitted that unapproved GE rice had been found in non-GE rice stocks.27Japan immediately halted all U.S. rice imports and Europe imposed heavy restrictions; in total, the event cost the U.S. rice industry $1.2 billion.28Biotechnology corporations do not have a track record of responsible ownership and control of their genetic traits, and in the case of GE salmon, this could be particularly damaging, not only to wild fish populations, but to the entire fishing industry.Competitive AdvantageBecause AquaBounty’s GE salmon is genetically designed to eat more and grow faster, its escape into the wild would mean the introduction of significant new competitive pres-sure on wild populations for food and space, as these large, voracious transgenic salmon attempt to quell their hunger by eating more and more. Currently, non-GE farmed salmon are naturally bred for faster growth, which often means bigger appetites. Once they escape in the wild, they exhibit greater aggression and risk-taking than wild species.29This competitive pressure would likely increase with GE salmon, which reportedly grow twice as fast as other salmon. In addition to out-competing their wild cousins for food and space, GE salmon could interfere with breeding in a vari-ety of ways, pushing wild stocks toward extinction. Added competitive pressure from GE fish can increase stress levels and increase mortality among the wild population, diminish-ing their ability to effectively breed.30In fact, several studies suggest that an invasion of transgenic fish into a natural fish population could eventually lead to the extinction of both wild and transgenic fish in that region.31AquaBounty claims that it will test each commercial batch of eggs it produces to ensure their sterility;however, this batch testing only needs to show a higher than 95 percent sterility rate, meaning that the company may be producing some fertile fish.32Additionally, the FDA has called Aqu-aBounty’s claim to raise only sterile fish “potentially mislead-ing” because up to 5 percent of eggs sold for grow-out could be fertile.33AquaBounty’s assurances hardly seem sufficient given the severe consequences that even a small number of fertile GE salmon could have on wild populations. Disease An additional concern about escaping GE salmon is the dis-ease they could spread to wild populations. Farmed salmon, which are raised in stressful, densely crowded environments, have already been linked to the spread of disease.Infectious hematopoictic necrosis, sea lice and furunculosis disease are three serious ailments that are believed to have been spread by farmed salmon into wild populations.34Adding larger, possibly more aggressive GE salmon to this system adds an-other way to spread the diseases found on factory fish farms to wild fish populations. Do GE Salmon Still Want to Swim Upstream?AquaBounty claims that their GE salmon will be “reared in physically contained facilities ... mitigating any poten-tial risk of a negative impact on genetic diversity of wild stocks.”35It is unclear how, or if, AquaBounty or the FDA will dictate to aquaculture companies how they must raise the GE salmon. The dominant method of raising salmon is in open net pens in the ocean, which have led to millions of salmon escaping.36AquaBounty has publicly noted the great interest it has received from salmon growers in China, Southeast Asia and Chile,37where regulations and oversight on aquaculture are notoriously weak. Given the large number of operators worldwide that would likely use GE salmon

### Frankenfish 2NC

#### GE Fish Harmful to Environment

Mercola 13 (granted fellowship status by the American College of Nutrition (ACN) in October 2012., amed the [top Ultimate Wellness Game Changer](http://www.huffingtonpost.com/arianna-huffington/huffpost-game-changers-yo_b_363624.html) by the Huffington Post,  interviewed on national and local news, including:Today Show, CNN, ABC's World News Tonight, the Dr. Oz Show, The Doctors, CBS, NBC and ABC local news shows, Time Magazine, Forbes Magazine, Dozens of Nationally Broadcast Radio Shows, also authored two New York Times Bestsellers, [The Great Bird Flu Hoax](http://www.nytimes.com/2006/10/22/books/bestseller/1022besthardadvice.html?_r=1) and [The No-Grain Diet](http://www.nytimes.com/2003/05/18/books/paperback-best-sellers-may-18-2003.html?pagewanted=3&src=pm)., “Act Now to Stop Genetically Engineered Fish from Receiving Approval, 1/8/13, http://articles.mercola.com/sites/articles/archive/2013/01/08/genetically-engineered-fish.aspx)

In a recent statement, Michael Hansen PhD, Senior Scientist with Consumers Union said:6¶ "The Environmental Assessment (EA) states that the FDA has found that the salmon is safe to eat. However, we are deeply concerned that the potential of these fish to cause allergic reactions has not been adequately researched. FDA has allowed this fish to move forward based on tests of allergenicity of only six engineered fish — tests that actually did show an increase in allergy-causing potential." [Emphasis mine]¶ But that's not all. The salmon — which contains a spliced-in growth hormone gene that makes it grow up to five times faster, reaching market size in about 18 months instead of three years — poses a significant threat to the environment and natural fish stocks as well. According to a Purdue University computer model that tracked the effects of releasing just 60 "Frankenfish" into a population of 60,000, there was a complete extinction of the normal fish in just 40 fish generations. It appears the larger size, which attracted mates more easily, combined with a slight reduction in survival rates, was a killer combination. Furthermore, according to Jeffrey Smith, Canadian scientists also engineered their own set of fast growing salmon and tested their behavior in tanks with other fish.¶ "When there was sufficient food, all was fine. When food stocks decreased, the Frankenfish freaked," he says. "They became cannibals, attacking and killing other fish — whether GE or natural. Their unexpected behavior resulted in population crashes or complete extinctions in the fish tanks. The study also suggested that if released, these ravenous aggressive salmon would pursue and consume other types of fish."¶ The FDA pooh-pooh's such fears. As reported by the New York Times:7¶ "The agency [FDA] said the chance this would happen was 'extremely remote.' It said the salmon would be raised in inland tanks with multiple barriers to escape. Even if some fish did escape, the nearby bodies of water would be too hot or salty for their survival. And reproduction would be unlikely because the fish would be sterilized, though the sterilization technique is not foolproof."¶ The issue of the sterility of the fish is a can of worms in and of itself. According to Hansen:¶ "...We are also concerned that FDA puts great weight, in their finding of 'no significant impact,' on the fact that the engineered salmon would be sterile females. However FDA indicates that only 95 percent of the salmon may be sterile, and the rest fertile. When you are talking about millions of fish, even one percent comes to thousands of fish. Moreover, perhaps even more important, the fish at the egg production facility in Prince Edward Island, Canada would obviously not be sterile — otherwise they could not produce eggs..."¶ And what about the promise that these GE salmon will be firmly landlocked, with no possibility of escape? This may sound good and well to some people, but it's important to remember how the process typically ends up working — "give them an inch and they'll take a mile," as the saying goes. George Leonard, writing for the National Geographic recently addressed this with the following statement:8¶ "While this initial application to grow GE salmon is for land-based facilities, the prospect of even larger profits from growing GE salmon in the ocean will certainly create pressure for approval in these more environmentally risky systems in the future.¶ The U.S. is poorly equipped to deal with this future scenario. In June 2011, NOAA Administrator Dr. Jane Lubchenco released a National Aquaculture Policy to guide how marine aquaculture proceeds in our ocean waters. While the policy includes some strong environmental provisions, it does not categorically prohibit the growing of GE fish in the ocean. It should.¶ Given FDA's action yesterday and NOAA's failure to prohibit GE fish in its aquaculture policy, the time has come for Congress to intervene. Congress should work to pass Senator Mark Begich's PEGASUS Act or similar legislation that requires FDA to take the environmental risks seriously before approving GE fish. If Congress doesn't act soon, the nation's ocean may suffer from FDA's efforts to chart a course for GE salmon."¶ Environmental Assessment 'Woefully Inadequate,' Scientist Says¶ The video above is two years old, but the arguments made in it remain unchanged. The video features Michael Hanson, a brilliant senior scientist with the Consumers Union (the publisher of Consumers Reports), and Val Giddings, a biotechnology consultant to various governments and companies. One major concern is that the containment systems designed to segregate these fish from wild fish could fail. I am convinced this is the MAJOR argument against the approval of these GE fish, not the allergencity of them. As explained by Hanson, the fact that the FDA is only looking at two facilities, both outside the United States, and that they've only performed an environmental assessment on ONE facility, specifically located on Prince Edward Island (PEI), is of major concern. There's no assessment of the environmental impact if the fish are produced elsewhere.

## Icebreakers

### Icebreakers 1NC

#### Icebreakers harmful to arctic life-could pose serious threats to entire ecosystem

Arctic Council 09 (“Arctic Marine Shipping Assessment Report 2009”, http://www.arctis-search.com/Potential+Disturbances+from+Ships+in+the+Arctic#Vessel\_Strikes\_on\_Marine\_Mammals)

Sound and Noise Disturbance¶ All vessels produce sound as a by-product of their operation. Typically, vessels produce low frequency sound from the operation of machinery onboard, hydrodynamic flow noise around the hull and from propeller cavitation, which is typically the dominant source of noise. The sound a vessel produces relates to many factors including size, speed, load, condition, age and engine type. The larger the vessel and/or the faster it is moving, the more noise it produces. Many vessels also employ hydro-acoustic devices such as commercial sonar, echo--sounders, side scan sonar for navigation, depth finding, seafloor mapping or to detect biologics as a regular part of their operations. These types of devices produce short pulses and use frequencies ranging from low to high, depending on their utility.¶ For most marine vertebrates, making, hearing and processing sounds serve critical biological functions. These include communication, foraging, reproduction, navigation and predator-avoidance. In particular, toothed whales have developed sophisticated biosonar capabilities to help them feed and navigate; large baleen whales have developed long-range communication systems using sound in reproductive and social interaction; and pinnipeds (i.e., seals, sea lion, walrus, etc.) make and listen to sounds for critical communicative functions. Many fish utilize sounds in mating and other social interactions.¶ The introduction of noise into the environment can adversely affect the ability of marine life to use sound in various ways and can induce alteration of behavior; reduction of communication ranges for social interactions, foraging, and predator avoidance; and temporary or permanent compromise of the auditory or other systems. In extreme cases, too much noise can lead to habitat avoidance or even death. Noise can also affect physiological functions and cause more generalized stress. Determining when impacts of noise exposure from any source become biologically significant to a species is often difficult. Nevertheless, this is an area where additional research is ongoing and needed in key areas.¶ Where there is an overlap between potential noise sources and the frequencies of sound used by marine life, there is particular concern as to how sound sources can interfere with important biological functions. The predominately low frequency sounds associated with large vessels is similar to the general hearing sensitivity bandwidths of large whales and many fish species. The ambient noise environment in the Arctic is more complex and variable than in many other ocean areas due to the seasonal variability in ice cover. In addition to natural sources contributing to background levels, anthropogenic sources, like vessel traffic, can also have a profound impact on these levels. In most regions in the northern hemisphere, shipping noise is the dominant source of underwater noise below 300 hertz.¶ Many environmental effects resulting from ship disturbances can be effectively mitigated through the use of best practices and the implementation of management measures. With regard to noise disturbances, such measures could include rerouting to avoid some areas in sensitive periods, lower speed, and alternative engine and hull designs to make ships more silent. There may be a need to plan potential future shipping lanes in the Arctic so as to avoid large seabird colonies, marine mammal haul-outs and other areas where animals are aggregated. In late 2008, the IMO’s Marine Environment Protection Committee (MEPC) formed a correspondence group that is now working to identify and address ways to minimize the introduction of incidental noise into the marine environment from commercial shipping in order to reduce the potential adverse impact on marine life. This group aims to develop non-mandatory technical guidelines for ship-quieting technologies, as well as potential navigation and operational practices for all IMO member states. This work will be aimed at the global shipping industry and is not likely to contain Arctic specific considerations.¶ Icebreakers and Disturbance*¶* All icebreaking operations, whether by independent commercial icebreaking ships or government icebreaker escort, can potentially cause disturbances to wildlife and local communities both through the noise they create and the trail of open water left astern. Compared to other vessels, icebreakers produce louder and more variable sounds. This is because of the episodic nature of the icebreaking, which involves ramming forward into the ice and then reversing to begin the process again. Some icebreakers are equipped with bubbler systems to aid in clearing ice from the vessel’s path and these can create an additional noise source. Noise from bubbler systems and propeller cavitation associated with icebreaker movement has the potential to alter animal behavior and to disrupt the hearing ability and vocalization of marine mammals.¶ Wildlife has been found to exhibit a range of behavior in the presence of icebreakers. For example, beluga whales were found to be aware of the icebreaker vessels presence at distances of more than 80 kilometers away, and exhibit strong avoidance response at 35 to 50 km away. However, narwhal whales were found to display only subtle responses to the same disturbance.¶ The opening of channels through the ice by icebreaking vessels can impact Arctic residents and alter animal behavior. Open water channels take time to freeze and this can disrupt the movements of animals and people over the ice. In many areas of the Arctic in winter, the only naturally occurring ice openings are polynyas caused by winds or ocean currents. Artificially opened water channels can be problematic for marine mammals and other species, which confuse them for polynyas and can get trapped too far from the ice edge as the channel eventually refreezes.¶ Vessel Strikes on Marine Mammals¶ Vessel collisions, resulting in death or serious injury of marine mammals, are a threat to marine organisms worldwide. Vessel collisions or ship strikes occur mainly with large whale species, small cetaceans (i.e., dolphins, narwhal, beluga), marine turtles and sirenians (i.e., manatees, dugongs). Records indicate that nearly all large whale species are vulnerable to ship strikes. Vessel collisions with marine mammals can result in death, massive trauma, hemorrhaging, broken bones and propeller wounds.¶ Databases have been constructed which track the number of ship strikes occurring. These report more than 750 known cetacean vessel strikes through the world’s oceans, including nearly 300 incidents involving large whales. Virtually all motorized vessel types, sizes and classes are represented in these databases. It should be noted, however, that any database will likely underestimate the number of actual occurrences because many go either undetected or unreported. In some cases carcasses are found, but because injuries are internal or due to advanced decomposition, it may be difficult to determine cause of death. When large vessels are involved, the mariner may not be aware that a strike has occurred.¶ There are relatively few known incidents of Arctic or ice-adapted marine mammal species being involved in ship strikes. The relatively infrequent occurrence is a result of relatively lower vessel traffic in high latitudes as compared to major trading routes and human population centers in lower latitudes. However, of consideration is that certain Arctic species, such as the bowhead and Pacific right whale, have features that make them potentially vulnerable to ship strikes, particularly as vessel traffic increases in their waters. Arctic toothed whales, namely narwhals and beluga whales, are probably less vulnerable to ship strikes, given their greater maneuverability and social behavior that lends them to aggregating in large groups enhancing their detection. It should be noted, however, that records of roughly comparable mid-sized species such as pilot whales, killer whales and various species of beaked whales also appear in ship strike databases.¶ Vessel speed has been implicated as a key factor in the occurrence and severity of vessel strikes with large species. Several independent studies indicate that vessel speeds of 10-14 knots increase by one-half or greater the probability that a whale will survive a collision with a ship.¶ As vessel traffic increases in the Arctic, modifications to customary vessel operation in key cetacean aggregation areas or vessel speed restrictions can be an effective measure to mitigate potential impacts on vulnerable species such as bowhead whales and, to a lesser extent, narwhals, beluga whales and other Arctic marine organisms. Where feasible, vessel routing measures may also be applied in order for ships to avoid known cetacean aggregation areas. A number of steps have been taken by some states outside the Arctic region to reduce the threat of ship strikes to endangered large whale species, including shifting shipping lanes and applying to the IMO to establish a vessel “Area to be Avoided.” The IMO’s MEPC is currently working on development of a non-mandatory guidance document for minimizing the risk of ship strikes on cetaceans which will be aimed at the global maritime industry.¶ Light Disturbance*¶* Birds of all species appear to be attracted to lights. This puts them at risk of collision with lighted structures. The attraction to light and resulting risk of collision varies depending on the weather, season and the age of the bird. The fall migration in the Arctic is when most bird attraction and collision issues emerge, as young birds are traveling for the first time and inclement weather becomes more frequent. Light attraction of marine birds is not yet a significant issue in the Arctic. This is because most birds are in the Arctic in the summer months to breed, when there is little or no darkness; and most Arctic-breeding seabirds are diurnal and, therefore, less active at night.¶ Despite these factors, there are still risks. During the non-breeding period in ice-free waters and as the presence of lighted ships and structures increases, risks are heightened. A wide variety of nocturnal species nest in the North Pacific, especially in the Aleutian Islands. Storm-petrels are vulnerable in late summer and early fall, when hundreds have been known to pitch on a vessel during foggy conditions. These problems are not unique to the smaller nocturnal species. Common and king eiders, both large ducks, have collided with large shrimp vessels in waters off western Greenland, causing injury or death.¶ Introduction of Invasive Species*¶* The introduction and spread of alien invasive species is a serious problem that has ecological, economic, health and environmental impacts, including the loss of native biological diversity worldwide. Although the introduction of invasive species into the Arctic environment has been minimally studied, it is an issue that deserves further study in the context of a changing climate and potential increased shipping in the Arctic region. The risk of introduction of invasive species will increase as shipping volume increases in this region. As with ship operations in non-Arctic areas, the threat of introduction comes from four sources: ballast water discharge, hull fouling, cargo operations and casualties or shipwrecks.¶ • Ballast Water¶ The IMO’s International Convention for the Control and Management of Ships Ballast Water & Sedimentsaddresses ballast exchange and treatment. As of November 2008, 16 states including Norway, representing about 3.6 percent of the world’s merchant shipping, have ratified this convention. Under the IMO convention standard, a small percentage of viable organisms will still be discharged.¶ • Hull Fouling¶ In subarctic waters, transfer of aquatic invasive species on the hulls of ships has become a serious threat to the environment, rivaling ballast water discharge. However, hull coatings on icecapable vessels may be effective antifouling agents, as would the scouring effects of passage through ice.¶ • Cargo¶ Most international movements of goods are regulated by fumigation and biosecurity provisions to prevent the movement of invasive species in cargo. This is also applicable to the Arctic region. Much of the sealift and re-supply movements into the Arctic are palletized, increasing the potential for unwanted organisms to be entrained in the cargo.¶ • Casualty¶ Ship accidents and sinkings can introduce invasive species into the local environment. As an example, shipwrecks in the Aleutians have caused significant ecological damage through the introduction of predatory rat species onto islands that have large aggregations of nesting seabirds.¶ Due to climate change and the potential increase in shipping activity, the introduction of invasive species may require more attention than it has received in the past. In particular, trans-Arctic shipping between the North Atlantic and North Pacific could potentially represent a vector for transfer of species in ballast water or on hulls to new areas where the environmental conditions resemble those in their home waters. Introduction of rodent species to islands harboring nesting seabirds, as evidenced in the Aleutian Islands, can be devastating. With limited baseline data on what species might actually be at risk from ship operations such as ballast water discharge, the use of the precautionary approach and proactive preventative actions are encouraged.¶

### Icebreakers 2NC

#### Paint from icebreakers harmful to marine life-costs millions to clean up

Catchpole 04 (Heather, freelance writer and editor specializing in science journalism, Degree in Science and a Masters in Science Communication from the ANU., ABC Science, “Toxic paint toys with marine sex life”, 5/25, http://www.abc.net.au/science/articles/2004/05/25/1114758.htm)

Toxic chips of paint flaking away from the hulls of ships may affect the sex life of Antarctic marine animals, say Australian and New Zealand researchers.¶ The paint contains the chemical tributyltin (TBT), which the researchers say has been flaking away from icebreakers as they plough through thick ice fields.¶ The researchers are concerned as this is the first time that TBT, a known disrupter of marine life, has been found in Antarctica.¶ Researchers led by toxicologist Dr Andrew Negri from the[Australian Institute of Marine Science](http://www.aims.gov.au/) (AIMS) in Townsville published details of the contamination online ahead of print publication in the [*Marine Pollution Bulletin*](http://www.sciencedirect.com/science/journal/0025326X).¶ Negri and team found TBT in sediments from the Ross Sea, off the east coast of Antarctica.¶ TBT is a made almost exclusively as an ingredient for marine antifouling paints to prevent the growth of organisms such as barnacles and algae on ships' hulls.¶ As well as icebreakers, Negri said that tourist ships, supply ships and fishing vessels could be responsible for the contamination.¶ "People in Antarctica have told us they see paint on the ice where it's scraped off from the ships," he said.¶ "We have spoken to paint companies who supply antifouling paint and they confirmed that TBT was being used on ships regularly going to Antarctica."¶ In some areas the researchers found concentrations of 1000 micrograms of TBT per kilogram of sediments.¶ This is the same as the concentration found in Queensland in November 2000 when a ship collided with Sudbury Reef east of Cairns, scraping antifouling paints onto rocks and sediments of the coral reef.¶ The [Great Barrier Reef Marine Park Authority](http://www.gbrmpa.gov.au/) said this cost A$2 million (about US$1.4 million) to clean up and monitor.¶ And the researchers said the TBT caused marine snails there to have an unwanted sex-change.¶ Marine snails change sex depending if that improves their chance of reproducing.¶ AIMS microbiologist Dr Nicole Webster said the effect on the snails in Antarctica could be drastic as snails reproduced very slowly in cold temperatures.¶ The TBT could also affect the ability of sponge and coral buds or larvae to settle on the sea floor, said Webster, and could have a longer-term affect on animals higher up the food chain, such as marine mammals.¶ The team found TBT in marine sediments near the research station Scott Base, operated by New Zealand, and the U.S. McMurdo Station, which are serviced by large icebreakers. They also found TBT at two pristine sites further from the bases.¶ TBT is banned on ships smaller than 25 metres and is being phased out on larger ships. But its replacement, a copper-based paint, is also acutely toxic to marine invertebrates, Webster said.¶ "In tropical waters where there is a lot of algal growth they really need to use antifouling paints," she said. "In Antarctic water maybe these heavy duty antifouling paints aren't necessary."¶ She said this was because algae and barnacles grow more slowly in colder waters and don't significantly foul the hulls of ships travelling there.¶

## Natural Gas

### NG 1NC

#### Natural gas release into water causes the deaths of numerous flora and fauna

Patin 99 – Stanislav, two Ph.D. degrees (Chemistry and Biology), a Professor of Ecology and Corresponding Member of the Contenant International Academy, "Natural gas in the marine environment," October, http://www.offshore-environment.com/naturalgas.html

An important anthropogenic source of gas hydrocarbons in the water environment is the offshore drilling accidents. Their environmental consequences can be very hazardous. Especially dramatic situations developed in the Sea of Asov as a result of two large accidents on drilling rigs in the summer-autumn of 1982 and 1985. These accidents caused long-term releases of large amounts of natural gas into the water accompanied by self-inflaming of the gas. During these events, the levels of methane in surface waters exceeded the background concentrations up to 10-100 times. The air samples also showed very high concentrations of methane. These accidents drastically disturbed the composition and biomass of the water fauna and caused mass mortality of many organisms, including fish and benthic mollusks. Similar incidents probably took place in other regions of the world as well. However, there are no publications on this topic available.

### NG 2NC

#### Hydrogen sulfide in natural gas is poisonous and can affect human health

Patin 99 – Stanislav, two Ph.D. degrees (Chemistry and Biology), a Professor of Ecology and Corresponding Member of the Contenant International Academy, "Natural gas in the marine environment," October, http://www.offshore-environment.com/naturalgas.html

Another component of natural gas - hydrogen sulfide - is water soluble in contrast with methane. It can cause hazardous pollution situations in both the atmosphere and the water environment. Its proportion in the composition of natural gas and gas condensate, as previously mentioned, sometimes reaches more than 20%. Pollution by hydrogen sulfide can lead to disturbances in the chemical composition of surface waters. This gas belongs to the group of poisons with acute effects. Its appearance in the atmosphere and hydrosphere can cause serious economic damage and medical problems among local population. Unfortunately, in Russia, air, soil, and water pollution by hydrogen sulfide and sulfur dioxide has been reported in a number of regions. Especially severe consequences for human health and biota have been observed in the basin of the low Volga River in the zone of development of the Astrakhanskoe gas condensate field [Ecology and impact of natural gas on organisms, 1989].

#### Natural gas chronically poisons fish.

Patin 99 – Stanislav, two Ph.D. degrees (Chemistry and Biology), a Professor of Ecology and Corresponding Member of the Contenant International Academy, "Natural gas in the marine environment," October, http://www.offshore-environment.com/naturalgas.html

The first important feature is the quick fish response to a toxic gas as compared with fish response to other dissolved or suspended toxicants. Gas rapidly penetrates into the organism (especially through the gills) and disturbs the main functional systems (respiration, nervous system, blood formation, enzyme activity, and others). External evidence of these disturbances includes a number of common symptoms mainly of behavioral nature (e.g., fish excitement, increased activity, scattering in the water). The interval between the moment of fish contact with the gas and the first symptoms of poisoning (latent period) is relatively short. Further exposure leads to chronic poisoning. At this stage, cumulative effects at the biochemical and physiological levels occur. These effects depend on the nature of the toxicant, exposure time, and environmental conditions. A general effect typical for all fish is gas emboli. These emerge when different gases (including the inert ones) oversaturate water. The symptoms of gas emboli include the rupture of tissues (especially in fins and eyes), enlarging of swim bladder, disturbances of circulatory system, and a number of other pathological changes.

### NG—Methane Hydrates Link

#### The effects of methane hydrates contribute greatly to global warming

Patin 99 – Stanislav, two Ph.D. degrees (Chemistry and Biology), a Professor of Ecology and Corresponding Member of the Contenant International Academy, "Natural gas in the marine environment," October, http://www.offshore-environment.com/naturalgas.html

The global consequence of all these anthropogenic impacts is the gradual increase of methane concentration in the atmosphere over the last 100 years - from 0.7x10-4% to 1.7x10-4% (in volume). Many scientists believe that gases released due to human activities have already begun to affect the earth's overall temperature and the methane anthropogenic emission is responsible for about 30% of the total warming effect. If the concentrations of methane and other greenhouse gases in the atmosphere keep increasing, global changes in climatic conditions on the earth will be noticeable in the near future.

## Navy Testing

### Navy Testing 1NC

#### Navy Testing hurts sea life

**Associated Press 12, “**Navy study: Sonar, blasts might hurt more sea life,” http://www.scientificamerican.com/article/does-military-sonar-kill/

HONOLULU – The U.S. Navy says its training and testing using sonar and explosives could potentially hurt more dolphins and whales in Hawaii and California waters than previously thought. The new research and more thorough analysis are part of a draft environmental impact statement covering Navy training and testing planned for 2014-2018. A notice about the study is due to appear in the Federal Register on Friday. In the study, the Navy estimates its use of explosives and sonar may unintentionally cause more than 1,600 instances of hearing loss or other injury to marine mammals in one year. The service calculates that its use of explosives may inadvertently cause more than 200 marine mammal deaths a year. The old Navy analysis -- covering 2009-2013 -- estimated the service might unintentionally cause injury or death to about 100 marine mammals in Hawaii and California, although no deaths have been reported. SUMMARY The Navy uses sonar to track enemy submarines, torpedoes, and other underwater threats. Scientists say the sound may disrupt the feeding patterns of marine mammals. Old analysis estimated it might unintentionally cause injury to about 100 marine mammals (no deaths have been reported). New report fears more than 1,600 instances of hearing loss or other injury in one year -- and more than 200 deaths. The Navy isn't saying it will injure whales and dolphins as it trains sailors and tests equipment. It's telling the public and environmental regulators that its actions have the potential to harm or otherwise prompt a reaction in the animals. The Navy takes a variety of measures to prevent harm to the animals, including turning off sonar when marine mammals are spotted nearby. It says the actual numbers of injured animals would be lower as a result.

## Offshore Wind

### Offshore Wind 1NC

Wind farms disrupt marine ecosystems  
Moore 12

”Nature Report: Threatening Turbines Raise Concerns” by [Richard Moore](http://www.valleycentral.com/about/bio.aspx?id=624) Posted: 03.26.2012 at 5:40 AM Richard Moore hosts "The Nature Report" every Monday and Wednesday.

An environmental impact statement or EIS has been ordered by the United States Army Corps of Engineers to assess the potential impact of a massive wind turbine industrial complex proposed by Baryonyx Corporation just offshore from South Padre Island in 41,000 acres of Gulf of Mexico waters leased from the state of Texas. Thus far, no offshore wind farms have been built in the United States and many citizens believe that offshore from South Padre is the worst place in the country to erect hundreds of huge turbines fearing they will kill birds and cause extensive damage to the marine environment. According to the United States Fish and Wildlife Service, poorly sited wind turbines kill approximately 440,000 birds each year, and this is undoubtedly a gross underestimate as the industry is largely self-regulated. Recent radar studies of bird migration along the lower Texas coast reveals it to be perhaps the most important migratory corridor in the world, and many of these birds fly directly across the Gulf of Mexico. In addition to threatening the 300 million dollar a year nature tourism industry in the Rio Grande Valley, the proposed offshore turbines also have recreational fishermen and shrimp boat owners alarmed. Walt Kittelberger, the president of the Lower Laguna Madre Foundation said, "Offshore it will have up to 25 square miles of area, and what is important for all the fishermen, whether they are commercial fishermen, shrimpers or just people who like to go out on their boats is that these things create what are called exclusion zones, where you cannot travel thru them." Carlton Reyes, the president of the Brownsville Port Isabel Shrimp Producers Association said, "Our concerns have to do with hazards to navigation and the potential loss of fishing area." If you would like to attend a public hearing and voice your concerns or support for the proposed offshore wind turbine project a meeting is set for Wednesday March 28th beginning at 6 pm at the Holiday Inn on North Expressway in Brownsville.

### Offshore Wind 2NC

#### Infrasound from wind farms damage marine animals ability to survive

Buxton 06

“Low Frequency Noise and Infrasound” Ivan Buxton 2006, <http://docs.wind-watch.org/buxton-infrasoundandlandbasedanimals.doc> Writer for wind watch (Merkley)

Sources of infrasound and LFN are many and varied with constant new additions. Some are controversial for reasons including noise emissions. Wind turbine generators were raised as a noise concern some years ago. Yet only recently have reports been released by the wind industry with results of desktop studies and none seem to have been conducted on wild animals at wind farms. A UK press release in 2005 suggested blame for the death of baby seals was due to mother seals aborting their pups through disturbance from pile driving for foundations for off shore wind turbines. Elsewhere some studies have shown that sea mammals, fish, birds and animals exposed to excessive LFN and infrasound has caused them harm. The hearing abilities of creatures other than man are difficult to determine. Even with sea mammals where studies have been concentrated because of fears surrounding noise created by human activities, only relatively little research exists into the range of hearing. Whales, dolphins and porpoise have all shown signs of distress from exposure to varying levels of noise at low frequencies and from a variety of sources. Research has shown fish ears are damaged by noise from repeated use of under water air guns and behavioural studies determined the fish became disoriented and consequently were vulnerable. There are a great number of articles that include reference to the effects of infrasound upon humans. The frequency ranges are recorded in many of these and the overall result always appears to depend upon the exposure time when coupled with the dB and Hz levels. A few seconds is all it takes at very low Hz and high dB levels before severe problems arise. Even at a level of dB normally found comfortable for listening to music for example, if the Hz level is low then a significant adverse reaction has been reported. There is reason to suppose that similar effects would also occur with wild animals if exposed to the sounds for long enough periods. The presumption must be that as soon as they felt uncomfortable they would move away from the zone of discomfort. A term more properly described as, disturbance and displacement, which in the case of protected species would be contrary to appropriate legislation. The concerns of the effects of infrasound are clearly real whether they are upon humans, marine life or land based and freshwater creatures and in extreme cases the results of high levels of exposure could be lethal. Even relatively low levels can be debilitating and create disturbance. Laboratory studies upon animals have been revi]ewed with quite chilling results, as it clear that deformities, damage and impairment occur to the subjects with regularity. Admittedly the animals were contained and subjected to exposure times of several hours per day at moderate to high intensity levels of LFN and infrasound. Yet fish and aquatic creatures contained in ponds and lakes would certainly be unable to escape whatever the level of sound intensity or duration of exposure. Other experiments signify that indirect consequences can arise from exposure to LFN due to the masking effect. Sounds from wind turbines are believed to have disguised the danger of rotating blades and caused the death of large numbers of birds. A report concluded that birds probably couldn’t hear the noise of the blades as well as humans can and would be unable to see them because of motion smear.

#### Construction of wind farms damage the environment

Mann and Teilmann 13

“Environmental impact of wind energy” J Mann1 and J Teilmann2 28 May 2013 <http://iopscience.iop.org/1748-9326/8/3/035001/pdf/1748-9326_8_3_035001.pdf> Department of Wind Energy, Technical University of Denmark (Merkley)

The most disturbing effect may be the ramming of wind monopile foundations into the seabed. This creates some of the loudest sounds emitted and may be heard by these animals hundreds of kilometers away in deeper waters and are strong enough to cause physical damage at short ranges. A study on the first German offshore wind farm showed that fewer animals were detected up to 25 km from the ramming site and that the displacement period (up to 6 days) was positively correlated to the duration of the ramming (Dahne¨ et al  [201](#page4)3). This is somewhat consistent with the only two similar studies by Tougaard et al ( [200](#page4)9) and Brandt et al ( [201](#page4)1) studying the effect of ramming in the two Danish wind farms in the North Sea. Both Scheidat et al ( [201](#page4)1) and Teilmann and Carstensen ( [201](#page4)2) have studied the effect on harbor porpoises over several years in two of the first large scale offshore wind farms in the world. Both studies did observations both before and after the installation of the turbines using acoustic data loggers placed on the sea bottom inside and outside the wind farm. Scheidat et al ( [201](#page4)1) found a significant increase of 160% in the presence of porpoises 1–2 years after the wind farm was in normal operation, compared to the baseline period (the construction period was not studied). It was suggested that this could be caused by less ship traffic and more food due to the ban of fishery inside the wind farm. Teilmann and Carstensen ( [201](#page4)2) studied the Nysted Offshore Wind Farm before, during and after the construction of the 72 gravity foundation wind turbines. A significant negative effect was found with 89% fewer porpoises inside the wind farm during construction and 71% fewer 10 years later compared to the baseline values. Although there are indications of a slight recovery, this is in clear contrast to the results from the Netherlands indicating that other factors interact with the farms and the ecosystems in highly unpredictable ways. Whether it is the longer construction time of the gravity foundations, differences in underwater noise levels, or difference in motivation to be in the area despite disturbing effects from the wind farm, that cause this difference is still to be studied

### Offshore Wind—REM 2NC

#### Wind turbines use rare earth magnets

FRE 12

[www.frontierrareearths.com/media-cover/blog/68--demand-for-neodymium-from-wind-turbines#sthash.JxvntL6k.dpuf](http://www.frontierrareearths.com/media-cover/blog/68--demand-for-neodymium-from-wind-turbines#sthash.JxvntL6k.dpuf) Demand for “Neodymium from Wind Turbines” 30/11/2012 Frontier Rare Earths is an exploration and development company principally focused on projects in Africa. (Merkley)

Wind turbines are generally considered the most cost effective source of carbon reduction and are competitive with wholesale electricity prices in certain markets. The World Energy Outlook which was released by the International Energy Agency in 2012 underscores this point. Global installed wind capacity is projected to double by 2020 and quadruple by 2035 to 923 GW. The graph below shows the rise in wind power depending on the scenario. The 450 scenario is consistent with a 50% chance of keeping global warming below two degrees. At the Hong Kong conference on rare earths JLMag projected that global demand for rare earth permanent magnets from wind would increase from 4500 tonnes in 2012 to 8000 tonnes in 2014 assuming stable neodymium, praseodymium and dysprosium pricing. Traditional wind generators are inefficient at low wind speeds, while direct drive wind turbines which use neodymium-iron-boron magnets can operate at low wind speeds and improve wind farm economics. A 3 MW wind turbine can use up to 2,700 kg of NdFeB magnets. While the increase in demand from rare earth turbines is still dependent on government subsidies, they will be increasingly favoured over their less efficient counterparts if rare earth prices are low.

#### Rare earth magnet mining destroys the environment

Hilsum 09

<http://www.pbs.org/newshour/bb/asia-july-dec09-china_12-14/> Lindsey Hilsum of Independent Television News examines how mining rare earth minerals -- considered to be an obscure yet profitable industry, is causing a major environmental dilemma in China. 2009 “Are Rare Earth Minerals Too Costly for Environment?” (Merkley)

LINDSEY HILSUM: It doesn’t look very green. Rare earth processing in China is a messy, dangerous, polluting business. It uses toxic chemicals, acids, sulfates, ammonia. The workers have little or no protection. But, without rare earth, Copenhagen means nothing. You buy a Prius hybrid car and think you’re saving the planet. But each motor contains a kilo of neodymium and each battery more than 10 kilos of lanthanum, rare earth elements from China. Green campaigners love wind turbines, but the permanent magnets used to manufacture a 3-megawatt turbine contain some two tons of rare earth. The head of China’s Rare Earth Research Institute shows me one of those permanent magnets. He’s well aware of the issues. ZHAO ZENGQI, Baotou Rare Earth Research Institute: The environmental problems include air emissions with harmful elements, such as fluorine and sulfur, wastewater that contains excessive acid, and radioactive materials, too. China meets 95 percent of the world’s demand for rare earth, and most of the separation and extraction is done here. So, the pollution stays in China, too. LINDSEY HILSUM: The authorities gave us a DVD of Baiyunebo in Inner Mongolia, where most of the world’s rare earth is mined, along with iron ore. They wouldn’t let us film it ourselves. But at Baotou, 100 miles away, we found the frozen tailing lake where rare earth mixes with mud, waiting for processing at nearby factories. Technologies we all use, like computers, mobile phones and energy-saving light bulbs use rare earths processed here. And local villagers whose farmland has been ruined by seepage from the lake pay the price. WANG CUN GUANG, farmer: The Baotou Environmental Protection Bureau tested our water, and they concluded that it wasn’t fit for people or animals to drink or for irrigation. LINDSEY HILSUM: For those who remember the old life, it’s hard to understand. The authorities pay compensation, acknowledging that the land has been ruined, but they haven’t yet relocated the villagers. JIA BAO CHENG, farmer: Rare earth is the country’s resource, but small people like us need to eat, too. We live on farming, but the crops no longer grow, and we will go hungry. LINDSEY HILSUM: At a rare earth conference in Hong Kong, the talk is of how to reduce dependence on China, which achieved 95 percent dominance by undercutting other producers. MARK SMITH, CEO, Molycorp Minerals: If the purpose is to lower our dependence on foreign oil, and all We’re doing is asking that we put hybrid cars on the road that need Chinese rare earth materials, aren’t we changing, you know, inter-trading one dependence for another? LINDSEY HILSUM: High on the frozen steppe of Inner Mongolia, a huge wind farm. China is aiming to be the world leader in wind energy. Chinese negotiators at Copenhagen may resist political commitments, but the government is already subsidizing new technologies to boost the economy and be sustainable. Deal or no deal at Copenhagen, there’s going to be an increased demand for wind turbines, both inside China and outside. But what the Chinese want to ensure is that they’re not just providing the essential raw materials, the rare earths, and doing the manufacturing, but that they also have access to the most advanced low-carbon technologies. We were shown plans for what they’re calling the Silicon Valley of rare earth, a high-tech industrial park in Baotou to attract international investors. This year, there was an outcry when the Chinese said they would restrict the export of rare earth to conserve their supply, and to make foreign companies produce their high-end technologies here in China. ZHAO ZENGQI: Although China has the largest reserves, we only have 50 percent of global deposits. We are supplying too much rare earth, and it’s not sustainable, so we must restrict export. LINDSEY HILSUM: The writing on the wall says: Become the leader of the world in rare earth industry. But China can’t produce enough for everyone anymore, and if governments are serious about low-carbon technologies, other countries will have to start producing. MARK SMITH: I think that, if we don’t get a couple of projects up and running very, very quickly, there’s going to be very severe shortage of rare earths in the world, and all of these clean-energy technologies that we’re legislating and trying to implement through policy changes are not going to be possible. LINDSEY HILSUM: Champions of a low-carbon future have yet to wake up to the environmental price Chinese workers and villagers are paying. At Copenhagen, politicians talk of cutting carbon emissions, but they can’t meet any targets without rare earth, and that means a sustainable supply, and not all from China.

### Offshore Wind—Warming DA

#### Wind Energy actually increases CO2 due to the irregularity of wind, inefficient backup generators need to power up and off frequently which is terrible for pollution

Post 12

“Wind Energy CO2 Emissions Reductions are Overstated” July 1st 2012, http://theenergycollective.com/willem-post/89476/wind-energy-co2-emissions-are-overstated , Willem Post, Willem Post, BSME'63 New Jersey Institute of Technology, MSME'66 Rensselaer Polytechnic Institute, MBA'75, University of Connecticut. P.E. Connecticut. Consulting Engineer and Project Manager. Performed feasibility studies, wrote master plans, evaluated and performed designs for incineration systems, air pollution control systems, utility and industrial power plants, and integrated energy systems for campus-style building complexes. Currently specializing in energy efficiency of buildings and building systems. (Merkley)

Dispatch Value: Wind energy is significantly different from conventional gas, coal, nuclear and hydro energy. Conventional generators, such as coal, gas and nuclear, are available for service 24/7/365, except during scheduled and unscheduled outages, i.e., reliable, staffed, fueled and controllable. Some are base-loaded or load-following, others can be put in service, i.e., dispatched, on short notice, whereas the “fuel” of wind turbines is a product of weather-dependent, variable wind speeds, i.e., its supply is unpredictable, unreliable and uncontrollable, and therefore, it has zero-dispatch value to a grid operator. Wind energy DISPLACES conventional energy on the grid, but in an inefficient manner. Wind energy does not REPLACE conventional energy. Real-time wind speed prediction has become more accurate in recent years. It gives a grid operator a few hours notice regarding ESTIMATES of wind speed changes, which will give him time to more efficiently order the starting or stopping of OCGTs and CCGTs to maintain adequate spinning and ramping capacity at all times. This extra “juggling” of generators just to accommodate wind energy is less efficient, i.e., consumes extra fuel/kWh and emits extra CO2/kWh, than without wind energy.

#### Wind farms affect surrounding temperatures and would disrupt marine ecosystems

**National Science Foundation 12**

April 30, 2012 “Night-warming effect found over large wind farms in Texas” <http://www.sciencedaily.com/releases/2012/04/120430152045.htm> National Science Foundation (Merkley)

Large wind farms in certain areas in the United States appear to affect local land surface temperatures, according to a paper published April 30 in the journal Nature Climate Change. The study, led by Liming Zhou, an atmospheric scientist at the State University of New York- (SUNY) Albany, provides insights about the possible effects of wind farms. The results could be important for developing efficient adaptation and management strategies to ensure long-term sustainability of wind power. "This study indicates that land surface temperatures have warmed in the vicinity of large wind farms in west-central Texas, especially at night," says Anjuli Bamzai, program director in the National Science Foundation's (NSF) Division of Atmospheric and Geospace Sciences, which funded the research. "The observations and analyses are for a relatively short period, but raise important issues that deserve attention as we move toward an era of rapid growth in wind farms in our quest for alternate energy sources." Considerable research has linked the carbon dioxide produced by burning fossil fuels with rising global temperatures. Consequently, many nations are moving toward cleaner sources of renewable energy such as wind turbines. Generating wind power creates no emissions, uses no water and is likely "green." "We need to better understand the system with observations, and better describe and model the complex processes involved, to predict how wind farms may affect future weather and climate," said Zhou. There have been a growing number of studies of wind farm effects on weather and climate, primarily using numerical models due to the lack of observations over wind farms. As numerical models are computationally intensive and have uncertainties in simulating regional and local weather and climate, said Zhou, remote sensing is likely the most efficient and effective way to study wind farm effects over larger spatial and longer temporal scales. To understand the potential impact of wind farms on local weather and climate, Zhou's team analyzed satellite-derived land surface temperatures from regions around large wind farms in Texas for the period 2003-2011. The researchers found a night-time warming effect over wind farms of up to 0.72 degrees Celsius per decade over the nine-year-period in which data were collected. Because the spatial pattern of warming mirrors the geographic distribution of wind turbines, the scientists attribute the warming primarily to wind farms. The year-to-year land surface temperature over wind farms shows a persistent upward trend from 2003 to 2011, consistent with the increasing number of operational wind turbines with time. "This warming effect is most likely caused by the turbulence in turbine wakes acting like fans to pull down warmer near-surface air from higher altitudes at night," said Somnath Baidya Roy of the University of Illinois at Urbana-Champaign, a co-author of the paper.

## Oil Drilling

### OCS Oil Link 1NC

**OCS destroys the environment – multitude of warrants – no safeguards**

**NRDC, 09,** National Defense Research Council, “Protecting Our Ocean ¶ and Coastal Economies: ¶ Avoid Unnecessary Risks from ¶ Offshore Drilling”, http://www.nrdc.org/oceans/offshore/files/offshore.pdf

**Offshore Drilling Poses Serious** ¶ **Environmental Risk**s¶ Expanded offshore drilling poses the risk of oil ¶ spills ruining our beaches from Florida to Maine ¶ and along the Pacific Coast, bringing harm to ¶ those who live, work, and vacation along the ¶ coasts, as well as harming habitats critical to ¶ plants and animals. ¶ Oil spills can quickly traverse vast distances. ¶ For example, when powered by the Gulf of ¶ Mexico’s Loop Current, an oil spill in the eastern ¶ Gulf of Mexico could affect Florida’s Panhandle ¶ beaches and even travel around the Florida Keys ¶ to wreak havoc on estuaries and beaches from the ¶ Everglades to Cape Canaveral.1¶ Contamination ¶ from the massive 1989 Exxon Valdez oil spill ¶ reached shorelines nearly 600 miles away; if the ¶ spill had occurred on the East Coast, it would have ¶ extended from Massachusetts to North Carolina.2¶ In September 2008, Hurricane Ike destroyed ¶ oil platforms, tanks, and pipelines throughout the ¶ Gulf of Mexico, releasing at least a half-million ¶ gallons of crude oil.3¶ During Hurricanes Katrina ¶ and Rita there were 125 spills from platforms, rigs, ¶ and pipelines on the ocean’s Outer Continental ¶ Shelf, releasing almost 685,000 gallons of ¶ petroleum products.4¶ Worse yet, if you include the ¶ land-based infrastructure that supports offshore ¶ drilling, the damage from these two hurricanes ¶ includes 595 spills releasing millions of gallons of ¶ oil.5¶ Oil Spills Inflict Devastating Economic ¶ Losses Upon Coastal Communities¶ Oil spills exact a serious toll on coastal economies, ¶ including our approximately $35 billion ¶ commercial fishing and $60 billion ocean and ¶ coastal tourism and recreation industries.6¶ The ¶ damage and clean up costs following the Exxon ¶ Valdez spill were so extensive that Exxon paid ¶ out more than one billion dollars to the federal ¶ and state governments for damages and clean up ¶ costs—and still owes fishermen, Alaska Natives, ¶ business owners, and others a billion dollars to ¶ redress the spill’s harm.7¶ ¶ In another example of economic and ¶ environmental damage, a July 2008 accident ¶ between a chemical tanker and an oil barge ¶ discharged more than 270,000 gallons of fuel ¶ oil, closing a huge swath of the Lower Mississippi ¶ River to vessel traffic for several days. The Port ¶ of New Orleans, located at the center of the ¶ world’s busiest port complex, was shut down and ¶ residents were asked to conserve water when water ¶ intakes were closed to prevent contamination of ¶ drinking water.¶ Oil Spills Have Lasting ¶ Ecological Impacts ¶ According to the National Academy of Sciences, ¶ current cleanup methods can only remove a small ¶ fraction of the oil spilled into the ocean, leaving ¶ the remaining oil to continue affecting ocean ¶ ecosystems over time.9¶ Scientists investigating ¶ the long-term impacts of the Exxon Valdez spill ¶ estimate that nearly 20,000 gallons of oil from that ¶ spill remain in Prince William Sound, continuing ¶ to harm threatened and endangered species and ¶ undermine their recovery.10 Marine mammals, sea ¶ birds, fish, shellfish, and other sea life are extremely ¶ vulnerable to oil pollution and the long-term ¶ toxic effects can impair reproductive success for ¶ generations. Studies have shown that tiny amounts ¶ of oil—as little as one part per billion—can harm ¶ pink salmon and cause their eggs to fail.11 ¶ Spills Aside, Drilling Operations ¶ are a Major Source of Pollution¶ In addition to environmental damage from oil ¶ spills, the routine operations associated with ¶ offshore drilling produce many toxic wastes ¶ and other forms of pollution. For example, ¶ each drill well generates tens of thousands of ¶ gallons of waste drilling muds (materials used ¶ to lubricate drill bits and maintain pressure) ¶ and cuttings.12 Drilling muds contain toxic ¶ metals such as mercury, lead, and cadmium that ¶ may bioaccumulate and biomagnify in marine ¶ organisms, including in our seafood supply.13 ¶ The water that is brought up from a ¶ given well along with oil and gas, referred to ¶ as “produced water,” contains its own toxic ¶ brew of benzene, arsenic, lead, toluene, and ¶ varying amounts of radioactive pollutants. ¶ Each oil platform can discharge hundreds of ¶ thousands of gallons of this produced water daily, ¶ contaminating both local waters and those down ¶ current from the discharge.14 An average oil and ¶ gas exploration well spews roughly 50 tons of ¶ nitrogen oxides, 13 tons of carbon monoxide, ¶ 6 tons of sulfur oxides, and 5 tons of volatile ¶ organic chemicals.15 ¶ Drilling Exploration Activities ¶ Harm Marine Life¶ Seismic surveys designed to estimate the size ¶ of an oil and gas reserve generate their own ¶ environmental problems. To carry out such ¶ surveys, ships tow multiple airgun arrays that ¶ emit thousands of high-decibel explosive impulses ¶ to map the seafloor.16 The auditory assault from ¶ seismic surveys has been found to damage or kill ¶ fish eggs and larvae and to impair the hearing ¶ and health of fish, making them vulnerable to ¶ predators and leaving them unable to locate prey ¶ or mates or communicate with each other. These ¶ disturbances disrupt and displace important ¶ migratory patterns, pushing marine life away ¶ from suitable habitats like nurseries and foraging, ¶ mating, spawning, and migratory corridors.17 In ¶ addition, seismic surveys have been implicated in ¶ whale beaching and stranding incidents.18¶ Offshore Drilling Results in ¶ Onshore Damage¶ Offshore drilling requires the construction of ¶ significant onshore infrastructure such as new ¶ roads, pipelines, and processing facilities, which ¶ are often built on formerly pristine beaches. ¶ Thanks in part to drilling operations, Louisiana is ¶ losing roughly 24 square miles of coastal wetlands ¶ each year, eating away at natural storm barriers and ¶ increasing the risks of storm damage, including ¶ damage from oil spills.19

**Causes oil spills – those alone are sufficient to cause extinction**

Adams, 10, “The Guld Oil Spill: An Extinction Level Event?”, Blogspot, <http://coyoteprime-runningcauseicantfly.blogspot.com/2010/05/gulf-oil-spill-extinction-level-event.html>

The possibility of an extinction event? It's hard to say exactly what's going on in the Gulf right now, especially because there are so many conflicting reports and unanswered questions. But one thing's for sure: if the situation is actually much worse than we're being led to believe, there could be worldwide catastrophic consequences. If it's true that millions upon millions of gallons of crude oil are flooding the Gulf with no end in sight, the massive oil slicks being created could make their way into the Gulf Stream currents, which would carry them not only up the East Coast but around the world where they could absolutely destroy the global fishing industries. Already these slicks are making their way into Gulf wetlands and beaches where they are destroying birds, fish, and even oyster beds. This is disastrous for both the seafood industry and the people whose livelihoods depend on it. It's also devastating to the local wildlife which could begin to die off from petroleum toxicity. Various ecosystems around the world could be heavily impacted by this spill in ways that we don't even yet realize. There's no telling where this continuous stream of oil will end up and what damage it might cause. Theoretically, we could be looking at modern man's final act of destruction on planet Earth, because this one oil rig blowout could set in motion a global extinction wave that begins with the oceans and then whiplashes back onto human beings themselves. We cannot live without life in the oceans. Man is arrogant to drill so deeply into the belly of Mother Earth, and through this arrogance, we may have just set in motion events that will ultimately destroy us. In the future, we may in fact talk about life on Earth as "pre-spill" versus "post-spill." Because a post-spill world may be drowned in oil, devoid of much ocean life, and suffering a global extinction event that will crash the human population by 90 percent or more.

### OCS Oil Link 2NC

**Their evidence doesn’t assume the mindless all-out exploitation that they incentivize**

Flournoy, 11, Alyson Professor and Director of the Environmental and Land Use Law Program @ University of Florida Levin College of Law, ARTICLE: THREE META-LESSONS GOVERNMENT AND INDUSTRY SHOULD LEARN FROM THE BP DEEPWATER HORIZON DISASTER AND WHY THEY WILL NOT,” Boston College Environmental Affairs Law Review, 2011, 38 B.C. Envtl. Aff. L. Rev. 281

C. How to Learn from the Context of the Disaster: United States' Energy Policy A third meta-lesson from the BP Deepwater Horizon disaster is that the drilling of that particular offshore well is the result not just of private choice, but of a broader national policy on energy. MMS's oil leasing and permitting decisions reflect executive branch decisions about the disposition of publicly owned oil and gas resources. [n115](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n115) BP's decisions about exploration in that area were not made in a vacuum, but in the context of a set of laws and appropriations that create a variety of incentives that affect industry's behavior. Thus, to understand why the disaster occurred, it would be wise to look at the policy context that has produced the increasing rush to develop oil resources in deepwater, and increasingly in ultra-deepwater--areas that increase the complexity, risks, and uncertainty of drilling operations and potential accidents. [n116](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n116) The most visible leadership on this issue comes from statements of the Oil Spill Commission and its Co-Chair Bob Graham, who has repeatedly noted that the lack of an energy policy is an important issue related to the work of the Oil Spill Commission and one that must be addressed by the legislative and executive branches. [n117](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n117) [\*301] The current energy policy provides hefty subsidies for the highly profitable oil and gas industries to continue with their unwavering focus on producing more oil and gas. [n118](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n118) Although some say that the United States lacks an energy policy, it is more accurate to say that our leaders don't clearly articulate the operative energy policy. Perhaps this is because it is not a coherent one or because on close inspection it is difficult to justify in light of other stated priorities. A primary and often overlooked component of energy policy is the national policy on the privatization of public natural resources. U.S. policy is to give away its natural resources at bargain prices presumably to promote exploitation and development. [n119](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n119) A 2008 report by the Government Accountability Office compared U.S. royalty rates to those of 103 other jurisdictions, and only eleven had royalty rates lower than those of the United States. [n120](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n120) Moreover, the Government Accountability Office has made repeated reports of problems with uncollected royalties and with MMS's royalty-in-kind program that has led to underestimation of the royalties owed. [n121](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n121) Another significant component of the national energy policy is tax policy that directly affects investment in oil extraction. A 2005 Congressional Budget Office Report showed that many capital investments for oil extraction are taxed at a rate of nine percent, which ranks among [\*302] the lowest rates for any industry. [n122](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n122) Tax deductions and credits for the oil extraction industry amount to roughly $ 4 billion per year. [n123](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n123) Looked at as a whole, the current energy policy strongly encourages all-out exploitation of remaining domestic fossil fuel resources, and deepwater oil reserves in particular. If the public and elected officials believe that the risks that produced the Macondo Well blowout are unacceptable, an energy policy that will move us towards a clean energy path is a logical response. This could include increased government support for lower carbon, lower-risk energy paths. Despite the clear political opportunity provided by the Deepwater Horizon disaster for the President and Congress to focus attention on a broad clean energy policy, there have been few signs of any significant movement in that direction. [n124](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n124) The CLEAR Act included provisions that would eliminate some of the royalty relief for deepwater drilling, eliminate the disastrous royalty-in-kind program, and require BOEMRE to study global royalty payments to inform U.S. royalty policy. [n125](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n125) These are very positive steps that would reduce the mindless incentives for deepwater drilling and the unintended windfalls to oil companies. However, that Act has languished in the Senate. Moreover, even those proposed changes fail to address the broader question of whether policy should create incentives towards a cleaner energy path. In the wake of the November 2010 election, it seems highly unlikely that the Administration or Congress will have interest in this topic. [n126](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n126) CONCLUSION There is much that can be learned from the BP Deepwater Horizon disaster. Unfortunately, even learning the most specific lessons has proved a contentious and uncertain process. This Article suggests first that both industry and government must fundamentally rethink their approaches to safety and develop a culture that encourages and facilitates learning from mistakes. Second, it identifies the phenomenon of [\*303] hollow government, characterized by government lacking the resources and authority to protect the public interest and a policy process dominated by powerful economic interests, as a root cause of the BP disaster and a contributing factor to other recent national disasters, including the financial crisis. Hollow government also makes it unlikely that we will learn the third meta-lesson and address the longstanding need for a coherent energy policy. These lessons could help to avert future disasters and better enable government to protect public health, safety, and the environment. However, absent changes to address the underlying obstacles to learning, there seems little likelihood that the lessons will be learned.

#### Passing OCS weakens safety reviews – causes more accidents

Goldstein 11—Director of Government Affairs @ Natural Resources Defense Council [Dr. David Goldstein (Former project director for the Bipartisan Policy Center), “Casting Oil Upon the Waters: The House Drilling Bills,” Switchboard, Posted May 2, 2011, pg. http://tinyurl.com/3syxpcl

This week, the House could vote on three bills to expand offshore oil and gas drilling. It is remarkable enough that the House would take up such measures before Congress has done a thing to make drilling safer. But what is truly astounding about these bills is that they would actually make the system that governs offshore drilling weaker than it was before the disaster in the Gulf of Mexico. This is legislation that should give pause even to the most ardent proponents of offshore drilling. These bills are more than a Big Oil wish list; they are a sort of oil utopia—and they could make sense only in a utopian world in which oil spills could never ever happen, in which there are never conflicts between the oil industry and other economic interests like fishing and tourism, and in which oil companies always take environmental and safety concerns fully into account. It’s as if Rep. Doc Hastings (R-WA), the bills’ sponsor, set out to prove how apt it is to talk about the U.S. “addiction” to oil. Under these bills, the U.S. would truly be acting like an addict, willing to sell out any principle, dispense with any caution, endanger any asset to get its next fix. Again, these bills ought to be seen as irresponsible even by supporters of increased drilling. So what would the bills actually do? Let’s start with the most egregious one of all, H.R. 1231. The bill is designed to ensure that oil drilling occurs off the East Coast from Maine to North Carolina, off the coast of Southern California and in the Arctic Ocean and Bristol Bay. That sweeping decision alone is breathtaking. But the bill does this by mandating that at least half the unleased area in each of those regions be put up for lease sales each and every time the government puts outer continental shelf territory up for lease. (Offshore territory available for lease is identified in five-year plans; the next one will cover 2012-2017.) Now think about that. The bill doesn’t simply reiterate that the government could make these areas available for oil drilling. It doesn’t just say that the government has to figure out which parts of those coastal waters would be appropriate for oil drilling and open those. It doesn’t even say that this administration has to open up a set amount of acreage for oil drilling, regardless of the specific concerns in any region. It says that, in perpetuity, each time waters are opened to drilling, at least half of the available acreage in each area needs to be opened up to drilling—until, presumably, every bit of acreage is being drilled. This is replacing oil policy with a kind of oil mania. Under this bill, neither this administration nor any future one could ever decide to limit drilling off the coast of New England, the Mid-Atlantic states, Southern California or Alaska because of economic or environmental concerns. No administration could decide to “take a breather” before opening up more leases to see how previously permitted activities were working out, or because there had been a spill, or because there was unexpected damage to the ecology or tourism, or because a state objected, or because there was no additional capacity to respond to an emergency, or because the agency overseeing drilling was too overwhelmed to properly review proposals. At least half the remaining unleased territory would have to be put up for leasing each and every time no matter what had happened, no matter what could happen, no matter what concerns states or scientists or fishermen or federal officials might have. The bill goes beyond earlier proposals to open up drilling, many of which had at least limited provisions for states to opt out of drilling off their states and which were not as prescriptive. The bill is titled “Reversing President Obama’s Offshore Moratorium Act,” demonstrating that partisan animus is behind this bill as much as any interest in energy. But the title is a misnomer in any event. The bill ought to be called “A bill to prevent any president or other official or the public from ever deciding not to drill for oil everywhere, no matter what the facts on the ground are.” Not so pithy, perhaps, but it’s what the bill actually does. The other two bills, while less sweeping—it would be just about impossible to be more sweeping—are based on the same compulsion to remove any judgment, discretion and balance from drilling decisions. H.R. 1230 mandates that the government conduct three lease sales in the next year—for oil and gas drilling in the central and western Gulf of Mexico and off the coast of Virginia. These are areas the administration decided not to lease after the Deepwater Horizon disaster. But as with H.R. 1231, the problem is not just opening up areas to oil and gas drilling. The bill short-circuits the environmental review for these sales. Specifically, the bill blocks court review of the Environmental Impact Statements (EIS) prepared for the lease sales in the Gulf of Mexico. It does this by having Congress deem that the EISs have met the requirements of the National Environmental Policy Act. This deeming, of course, is simply a political judgment, based on nothing more than the wish that it be so. (The Virginia lease is treated differently, apparently because the military may have concerns with it. For the sponsors, court reviews are only legitimate when someone they like is bringing a lawsuit.) Shutting down the courts is particularly wrongheaded in this instance for two reasons. First, the environmental review for these leases was done by the pre-Gulf disaster Minerals Management Service, an agency notorious for its close relationship to the oil industry. Second, these environmental reviews did not take into account the damage caused by the Deepwater Horizon blowout (and therefore what could happen under these leases) because such a disaster was thought of as impossible at the time. So under H.R. 1230, what is Congress’ reaction to the Gulf disaster? It is mandating that the administration and the courts act as if it had never happened. This ought to be a dictionary definition of irresponsibility. H.R. 1229 is another effort to make the review of oil and gas drilling weaker than it was before the Gulf disaster. The bill sets an arbitrary time limit of 30 days for reviewing drilling permit applications and grants automatic approvals if no action has been taken within 60 days. Was the message of the Gulf spill to ensure that safety reviews be shorter and conducted “under the gun”? In fact, the National Oil Spill Commission recommended that Congress extend another 30-day review limit—and that one didn’t even have an automatic approval provision. H.R. 1229 also tries to make it harder to challenge any oil drilling decision related to the Gulf of Mexico by eliminating the ability of those who challenge the federal government successfully from having their legal fees reimbursed. Current law does not encourage frivolous suits—the fees are only paid if the suit is successful—but it does enable citizen groups to challenge bad decisions. And H.R. 1229 also has provisions to stack the decks against any plaintiff who still manages to sue. So the first bills on drilling to come before the Republican-controlled House since the Gulf disaster try to wish away that catastrophic event. They would open almost all the waters of the U.S. to oil drilling; prevent any judgments from being made about where and when and how to drill; tie the hands of this and future administrations and the courts; and weaken the system of safety and environmental review. Quite a legacy. As my colleagues have noted, additional drilling will have no impact on gasoline prices. This is not a solution to our problems, it is a way to create new ones. This is a bill written by people who are so hell-bent on drilling that they can’t even admit that there are consequences to be considered. This is not policymaking; it’s a new kind of magical thinking.

#### Oil remains in sediment - long term environmental impacts

Boehnke 13, higher education reporter for the Knoxville News Sentinel“UT experts: BP oil spill gone from deep ocean, but remains in marshes,” http://www.knoxnews.com/news/2013/apr/28/ut-experts-bp-oil-spill-gone-from-deep-ocean-but/

Scientists cannot find traces of oil in the deep water of the Gulf of Mexico three years after the nation’s worst offshore spill, but residual toxins are still in the sediment along the coastal marshes, according to scientists at the University of Tennessee who have studied the effects of the spill. Bacteria in the Gulf was already adapted to consuming oil that naturally leaks from the ground into the water there, said Terry Hazen, a Governor’s Chair for Environmental Biotechnology at UT and Oak Ridge National Laboratory. When the Deepwater Horizon oil rig exploded in April 2010, dumping 200 million gallons of crude into the Gulf, the population of that unique bacteria exploded and consumed the oil at a remarkable rate, said Hazen, who was a professor at University of California-Berkeley at the time. “The Gulf has an amazing capacity to take care of these things, including a lot of other organics and things coming out of the Mississippi River,” Hazen said. “I’m not saying that everything is hunky-dory but there is a lot of cleaning capacity there. Oil is a natural product, it’s just fossilized algae. So the ability to degrade oil is always there in nature.” Hazen was part of a team of researchers that tracked the oil during and in the months following the spill. His team used a new approach to discover these oil-eating bacteria. Thanks to a contract UT has with BP, he is now leading a team that is examining other potential deep-sea drilling sites around the world looking for similar bacteria. “It was an ecological catastrophe, but it did go away fast and we learned the best thing to do in the deep ocean is nothing at all,” Hazen said. “But the other lesson we learned is that once it gets to shore it sinks into the sediment fast and uses up the oxygen quickly, so the objective should be to get as much of the material away from shore as possible.” Annette Engel, a geochemistry professor at UT, has been working with a team studying the effects of the spill on the shoreline since she was on faculty at Louisiana State University in 2010. Though the marshes in southeastern Louisiana look like they’ve recovered, with a return of many of the birds, insects, fish and crabs, the sediment still contains oil, Engel said. Engel was one of many researchers who collected samples along the shore line after the rig explosion but before the oil reached landfall, which was in late May in some areas. Using those samples and other untainted sites as controls, the team has been watching to see how long it takes for the sediment to return to normal. In fact, some of the toxic, carcinogenic elements may stick around in the soil for a decade or more, their research has shown. “What we’re learning is you have to keep the oil out of the marshes, because once it’s there, certain components aren’t going anywhere for a long time,” she said. “But how do we plan that? We tried to keep it out of the marshes, but the scale was too big.”

#### The aff destroys the environment

DOW, 12, Defenders of Wildlife, "OUTER CONTINENTAL SHELF DRILLING", https://docs.google.com/viewer?a=vandq=cache:0hRYuUTRu6wJ:www.defenders.org/publications/impacts\_of\_outer\_continental\_shelf\_drilling.pdf+andhl=enandgl=usandpid=blandsrcid=ADGEESimvF33YzLvIENzYCceMo6rbZBgGL\_qq52L3lPQbQp9oCH-vySHbDLITJDlQ61o\_\_xCzITqYc56OWssn5OEjL5C7HATlZWYsBP4Ec9SoxALLnh9Rk0NY\_ANjAdUgfb3vh0C-e31andsig=AHIEtbSgOUGu\_Q4pEWJM2fsBDGMuNjtfvA

Ocean Floor. Drilling infrastructure permanently alters ocean floor habitats. Drill rig footprints, undersea pipelines, dredging ship channels, and dumped drill cuttings-- the rock material dug out of the oil or gas well-- are often contaminated with drilling fluid used to lubricate and regulate the pressure in drilling operations. The fluid contains petroleum products and heavy metals. Strewn on the ocean floor, contaminated sediments can be carried by currents over a mile from the rig, sharply reducing populations of small bottom dwelling creatures that are important to the rest of the food chain and biomagnifying toxic contaminants in fish we eat.

### OCS Oil: Arctic Link 2NC

#### Oil spills kill Arctic biodiversity

O’Rourke 12, Ronal O’Rourke, specialist in naval affairs, June 15th, 2012, “Changes in the Arctic: Background and Issues for Congress” http://www.fas.org/sgp/crs/misc/R41153.pdf

No oil spill is entirely benign. **Even a** relatively minor spill**, depending on the timing and location, can cause significant harm to individual organisms and entire populations**. Regarding aquatic spills, marine mammals, birds, bottom-dwelling and intertidal species, and organisms in early developmental stages—eggs or larvae—are especially vulnerable. However, the effects of oil spills can vary greatly. Oil spills can cause impacts over a range of time scales, from only a few days to several years, or even decades in some cases. Conditions in the Arctic may have implications for toxicological effects that are not yet understood. For example, **oil spills on permafrost may persist in an ecosystem for relatively long periods of time, potentially harming plant life through their root systems**. Moreover, little is known about the effects of oil spills on species that are unique to the Arctic, particularly, species’ abilities to thrive in a cold environment and the effect temperature has on toxicity.94 The effects of oil spills in high latitude, cold ocean environments **may last longer and cause greater damage** than expected. Some recent studies have found that oil spills in lower latitudes have persisted for longer than initially expected, thus raising the concern that the persistence of oil in the Arctic may be understated. In terms of wildlife, population recovery may take longer in the Arctic because many of the species have longer life spans and reproduce at a slower rate.95

#### Arctic oil spills lead to extinction

WWF 10 “Drilling for Oil in the Arctic Too Soon Too Risky” http://worldwildlife.org/publications/drilling-for-oil-in-the-arctic-too-soon-too-risky)

The Arctic and the subarctic regions surrounding it are important for many reasons. One is their enormous biological diversity: a kaleidoscopic array of land and seascapes supporting millions of migrating birds and charismatic species such as polar bears, walruses, narwhals and sea otters. Economics is another: Alaskan fisheries are among the richest in the world. Their $2.2 billion in annual catch fills the frozen food sections and seafood counters of supermarkets across the nation. However, there is another reason why the Arctic is not just important, but among the most important places on the face of the Earth. A keystone species is generally defined as one whose removal from an ecosystem triggers a cascade of changes affecting other species in that ecosystem. The same can be said of the Arctic in relation to the rest of the world. With feedback mechanisms that affect ocean currents and influence climate patterns, the Arctic functions like a global thermostat. Heat balance, ocean circulation patterns and the carbon cycle are all related to its regulatory and carbon storage functions. Disrupt these functions and we effect far-reaching changes in the conditions under which life has existed on Earth for thousands of years. In the context of climate change, the Arctic is a keystone ecosystem for the entire planet. Unfortunately, some of these disruptions are happening already as climate change melts sea ice and thaws the Arctic tundra. The Arctic’s sea ice cover reflects sunlight and therefore heat. As the ice melts, that heat is absorbed by the salt water, whose temperature, salinity and density all begin to change in ways that impact global ocean circulation patterns. On land, beneath the Arctic tundra, are immense pools of frozen methaneℐa greenhouse gas far more potent than carbon dioxide. As the tundra thaws, the risk of this methane escaping increases. 4 Were this to happen, the consequences would be dire and global in scope. As we continue not just to spill but to burn the fossil fuels that cause climate change, we are nudging the Arctic toward a meltdown that will make sea levels and temperatures rise even faster, with potentially catastrophic consequences for all life on Earth: no matter where one lives it. For the sake of the planet, losing the Arctic is not an option. Mitigating the impact of climate change there ultimately depends upon our getting serious about replacing fossil fuels with non-carbon-based renewable energies. Until we demonstrate the will and good sense to do that, however, the Arctic needs to be protected from other environmental threats that, compounded by the stress of climate change, undermine its resiliency and hasten its demise. Chief among those threats is offshore drilling ℐespecially in the absence of any credible and tested means of responding effectively to a major spill.

### OCS Oil: A2 Drilling Tech Safe

#### The drilling tech fails

Savitz 12, Jacqueline, Vice President of North American Oceans at Oceana, “Industry Won't Make Drilling Safe,” National Journal, , http://energy.nationaljournal.com/2012/04/what-more-can-be-done-to-ensur.php?comments=expandall#comments

The idea that offshore drilling safety and spill response have substantially improved is little more than a figment of some people’s imagination. In the question above, Michael Bromwich acknowledges that during the Deepwater Horizon disaster (DWH) safeguards were not effective, preparation was not adequate, and response tools were little better than they were 20 years ago. But what has really changed in the past two years? Sadly, not enough. Even the question itself, what the industry (private sector) can do to reduce risks, misses the point because it sidelines the needed government action to scale back drilling given the lack of sufficient safety and response options. Not to mention the lack of private sector solutions. Let’s look at the categories on the list: safeguards, preparations and response tools. Safeguards have barely changed. The last line of defense at the wellhead, the heavily relied upon blowout preventer (BOP), turns out to be flawed by design according to Det Norsk Veritas – not just the one on the Deepwater Horizon, but possibly the rest. Did the private sector fix that problem? Have BOPs been redesigned to be effective and replaced? No and no. So, there’s something the private sector could do, or rather should have done before resuming drilling. But it hasn’t been required and dangerous deep water drilling is already back in full swing. There are new testing and maintenance regulations for BOPs, but they don’t fix the underlying design flaw. So that means we need real improvements in the second category: preparations. Is industry more prepared now? Of course they are, just ask them. Their exploration plans brag about response times in days now, rather than the months that we are accustomed to. According to BP, if DWH happened again, it could plug a well in 2-3 weeks, much faster than the 3 months it took them last time. But what changed? Well, this time we are to assume the capping device will work -- except we really don’t know that. Just because it eventually worked on DWH doesn’t mean it will work next time on a different blowout with a differently oriented pipe or even a damaged wellhead. Maybe if the companies offered to pre-drill relief wells, then they could credibly promise a faster response. But the private sector isn’t offering that, and again, government hasn’t required it. So be ready for another 3-month ordeal. That takes us to response. It’s impossible to fully respond to a major spill. The DWH caused tremendous impacts on marine life and coastal economies. And the response tools are not much better now than they were 2 or even 20 years ago. We still rely on booms that don’t really work, and surface burns that may remove about 5% of the oil. And then there are always toxic dispersants that can be used to hide the problem, though they create new problems. As a result, the next spill will look like 2010 all over again. Response is little more than damage control.

#### Err on the side of irreversibility – even if it’s usually safe – accidents inevitably happen

DOW, 12, Defenders of Wildlife, "OUTER CONTINENTAL SHELF DRILLING", https://docs.google.com/viewer?a=vandq=cache:0hRYuUTRu6wJ:www.defenders.org/publications/impacts\_of\_outer\_continental\_shelf\_drilling.pdf+andhl=enandgl=usandpid=blandsrcid=ADGEESimvF33YzLvIENzYCceMo6rbZBgGL\_qq52L3lPQbQp9oCH-vySHbDLITJDlQ61o\_\_xCzITqYc56OWssn5OEjL5C7HATlZWYsBP4Ec9SoxALLnh9Rk0NY\_ANjAdUgfb3vh0C-e31andsig=AHIEtbSgOUGu\_Q4pEWJM2fsBDGMuNjtfvA

Spills, Leaks and Catastrophes. Even with safety protocols in place, leaks and spills are inevitable— each year U.S. drilling operations send an average of 880,000 gallons of oil into the ocean. Then there are the unanticipated catastrophes. In 2005, Hurricanes Katrina and Rita destroyed 113 of the oil platforms in the Gulf of Mexico and damaged 457 pipelines. Hurricane damage caused at least 124 different spills, totaling over 17,700 barrels (743,000 gallons) of petroleum products. Oil is toxic to the plants and microscopic animals that form the basis of the marine food chain. It also poisons birds, mammals and fish. Those not killed outright can suffer a slow death from debilitating illness and injury.

#### It fractures the ocean floor

Pravica, 12, Michael Professor of Physics and Astronomy @ [University of Nevada](http://content.usatoday.com/topics/topic/Organizations/Schools/University+of+Nevada), Las Vegas, “Letters: Science, not profit, must lead deep water drilling,” USA Today, Updated 4/24/2012 8:43 PM , pg. http://tinyurl.com/9g8x28q

¶ There are a few critical points not mentioned in the USA TODAY editorial on the BP oil spill that should have been addressed ("[Editorial: 2 years after BP spill, lower risks](http://www.usatoday.com/news/opinion/editorials/story/2012-04-19/BP-Deepwater-oil-spill/54419466/1)"). First of all, deep water drilling represents a "brave new world" of oil exploration and novel technology as humans probe depths of water, oil and rock that sustain thousands of atmospheres of pressure. At these levels, the technology used to drill and extract oil can easily fail as we approach the yield strengths of many of the confining materials subjected to extreme conditions. There is also a high chance of significant fracture of the cean/sea floor in drilling and hole erosion from gushing, hot and high pressure oil (along with particulates and other mineral-rich fluids) that could make repair nearly impossible and could permanently poison our waters.¶ The greatest lesson from the BP oil spill is that politicians and businessmen cannot solve problems created by our advanced technology. Only scientists and engineers can. We must listen to them and adopt a more rational approach to drilling that places safety above profit.

**Weak regulations encourage unnecessary risks – causes accidents**

Flournoy 11—Professor and Director of the Environmental and Land Use Law Program @ University of Florida Levin College of Law [Alyson C. Flournoy, “ARTICLE: THREE META-LESSONS GOVERNMENT AND INDUSTRY SHOULD LEARN FROM THE BP DEEPWATER HORIZON DISASTER AND WHY THEY WILL NOT,” Boston College Environmental Affairs Law Review, 2011, 38 B.C. Envtl. Aff. L. Rev. 281

Although this Article's primary focus is on law and policy lessons, it is important to note that these highly visible and concrete failures will likely lead industry to respond voluntarily by adopting some practices and procedures to avoid similar failures. [n27](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n27) From a law and governance perspective, however, simply allowing industry to learn voluntarily and police itself is widely viewed as inadequate for several reasons. [n28](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n28) Indeed, the regulatory environment that existed at the time of the blowout relied  [\*286]  heavily on industry self-regulation. [n29](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095" \l "n29) Investigation in the wake of the blowout has revealed that the Outer Continental Shelf Lands Act (OCSLA)--the law governing development of federally owned oil and gas resources on the Outer Continental Shelf--included few standards to assure protection of health, safety, and the environment. [n30](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095#n30) Additionally, the Minerals Management Service's (MMS) approach to regulation under the OCSLA relied heavily on standards developed by and voluntarily agreed to by industry. [n31](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095#n31) Of course, even with this weak regulatory regime, the threat of tort liability should have provided industry with an incentive to take steps to avoid catastrophic risk. [n32](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095#n32) However, it seems clear from most accounts that BP and its contractors failed to accurately assess the severity of the risks they faced. [n33](http://www.lexisnexis.com.proxy.library.emory.edu/lnacui2api/frame.do?reloadEntirePage=true&rand=1347732562226&returnToKey=20_T15531026576&parent=docview&target=results_DocumentContent&tokenKey=rsh-20.633384.4211442095#n33) Thus, relying on industry, market forces, and the tort liability system to deter similar conduct seems unwarranted and an abdication of government's role in protecting health, safety, and the environment.

### OCS Oil: A2 Response Solves

#### No capacity or resources to respond or identify risks

Geman 12, “Report: Interior has ‘limited’ ability to gauge offshore drilling risks,” The Hill, 08/29/12 05:37 PM ET, pg. http://tinyurl.com/cmkjo9r

A [new report](http://gao.gov/products/GAO-12-423) by congressional auditors finds that the Interior Department still has “limited” ability to identify and evaluate risks from offshore drilling projects, despite overhauling and toughening oversight after the 2010 BP oil spill. “Interior continues to face challenges following its reorganization that may affect its ability to oversee oil and gas activities in the Gulf of Mexico. Specifically, Interior’s capacity to identify and evaluate risk remains limited, raising questions about the effectiveness with which it allocates its oversight resources,” the Government Accountability Office report states. The July 30 report made public Wednesday arrives as Republicans, at their national convention in Tampa, Fla., are [vowing to greatly expand](http://thehill.com/blogs/e2-wire/e2-wire/245863-gop-platform-block-carbon-regs-expand-drilling) offshore access for oil-and-gas companies if Mitt Romney wins the White House. Interior, after the April 2010 spill began, announced it was dismantling its troubled Minerals Management Service and created what last year became separate agencies: The Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement. The GAO report credits Interior with safety reforms but concludes, “the ultimate effectiveness of Interior’s reorganization and recent policy changes remains uncertain.” The report lists a number of areas of concern. For instance it alleges that environmental analyses of companies’ exploration and development plans have occurred “without the most current, potentially relevant information.” The report also lays out concerns with offshore regulators’ information management system and inspections program. “Interior’s inspections routinely identify violations, but Interior’s [Technical Information Management System] IT system is missing some data, such as the date that violations were found or corrected. As a result, Interior does not know on a real-time basis whether or when all violations were identified and corrected, potentially allowing unsafe conditions to continue for extended periods,” the report states.

## OTEC

### OTEC 1NC

#### **OTEC degrades the ocean environment and causes algal blooms**

NOAA ND

<http://coastalmanagement.noaa.gov/otec/docs/environmentalfactsheet.pdf> National Oceanic and Atmospheric Administration (Merkley)

1. Withdrawal and Discharge Water: A 100 MW facility would use 10-20 billion gallons per day of warm surface water and cold water from a depth of approximately 3300 feet (1000 meters). The impacts of discharging this large volume of water in the ocean needs to be better studied. The water discharged from OTEC facilities will be cooler, denser and more nutrient rich due to the composition of the deep cold water being different from the receiving waters. Nutrient rich water (with nitrogen and phosphorus) would likely be discharged at a depth where the ambient water is warmer and oligotrophic (nutrient poor). The resulting indirect and cumulative impacts to marine biota and the dynamics of the marine ecosystem from these displacements are not fully understood. 2. Impingement and Entrainment: Screens are needed for both the warm and cold water intake systems to prevent debris and larger species from entering an OTEC facility. Impingement may occur where organisms become trapped against the intake screen. Smaller organisms which pass through the intake screen may be entrained through the system. Both could be lethal to the organisms. 3. Biocide Treatments: The warm water that is used in the OTEC facility would need to be treated with a biocide (e.g., chlorine) to maintain the efficiency of the heat exchangers in the OTEC facility. The amount of biocide needed will likely be less than the maximum discharge allowed under the Clean Water Act. 4. Other Potential Impacts: The electromagnetic field of the cable bringing the electricity to the shore may impact navigation and other behaviors of marine organisms. The platform presence may cause organism attraction or avoidance, and its mooring lines may cause entanglements. The noise generated from an OTEC facility may also impact marine mammals. Addressing Impacts: These potential impacts will be considered in the development of new regulations for licensing OTEC facilities, and in the Environmental Impact Statement (EIS) that must be developed for those regulations. In addition, these impacts will be considered in the review of individual applications which will require their own EIS. Those reviews will consider not only the direct, indirect and cumulative impacts of OTEC but also how those impacts may offset other impacts such as those associated with fossil fuels.

### OTEC 2NC

#### OTEC kills environment and turns warming **Fujita 90**

1990 RODNEY M. FUJITA- Staff Scientist for the New York time and a member of the Environmental Defense Fund “Ocean Energy Raises Environment Issues” New York Times <http://www.nytimes.com/1990/06/04/opinion/l-ocean-energy-raises-environment-issues-833990.html\> (Merkley)

Ocean thermal energy conversion is a promising new source of renewable energy (''Tapping Ocean's Cold for Crops and Energy,'' Science Times, May 22). Although the pilot facility in Hawaii you describe has not drawn protests from environmentalists, this does not mean the technology is completely benign. Some plans call for the use of R-22, a chlorofluorocarbon that is not completely ozone-friendly. It is also a powerful greenhouse gas. Planners should investigate fluids that are environmentally harmless. The potential for ecological disruption by ocean thermal energy conversion is enormous. It will work best in tropical regions, where the temperature difference between surface and deep water is greatest. Even when mixed with warm surface water to ameliorate environmental effects, the effluent carries a double shock to tropical marine ecosystems that have evolved within narrow temperature fluctuations and extremely low nutrient levels: the effluent is both cold and rich in nutrients. Ocean energy conversion will bring deep water very rich in carbon dioxide to the surface. Some carbon will escape to the atmosphere, perhaps ex-acerbating the greenhouse effect. We also need to know how pumping large amounts of ancient deep water to the surface will affect ocean circulation and heat distribution. Proponents of ocean energy conversion should study the feasibility of an integrated mariculture system to reduce levels of nutrients and increase the temperature of the effluent. The concept would be to grow salmon or some other cold-water, high-value fish in the effluent. This has worked very well at the pilot plant in Hawaii. While the water is still cold, nori, the seaweed used to make sushi (which has also been demonstrated to grow well in the Hawaiian system), could be grown in the salmon effluent to remove nutrients and add oxygen. The water could simply be stored and allowed to return to surface temperature or used to grow warm-water species of animals and plants so that even more of the nutrients are removed. This effluent is virtually free of disease organisms, which should improve public acceptance. A mariculture system using ocean thermal energy conversion effluent could produce valuable crops and release a nutrient-free, high-oxygen, low-carbon effluent at temperatures similar to those of receiving waters, minimizing the environmental impact of discharge and maximizing economic feasibility.

#### OTEC causes Algal Blooms and hurts the environment

Andrew 12

December 3rd, 2012He has been been reporting and writing on a wide range of topics at the nexus of economics, technology, ecology/environment and society for some five years now. Whether in Asia-Pacific, Europe, the Americas, Africa or the Middle East, issues related to these broad topical areas pose tremendous opportunities, as well as challenges, and define the quality of our lives, as well as our relationship to the natural environment. “DOE Publishes New Study On Biological Impact Of Ocean Thermal Energy Conversion (OTEC)” <http://cleantechnica.com/2012/12/03/doe-publishes-new-study-on-biological-impact-of-ocean-thermal-energy-conversion/> (Merkley)

When it comes to potential new renewable energy sources, [Ocean Thermal Energy Conversion (OTEC)](http://cleantechnica.com/2011/09/23/ocean-thermal-energy-conversion/) has a lot going for it. Greenhouse gas emissions and their climate change effects, ongoing ecosystem and biodiversity loss and degradation, and already high fossil fuel prices — with the likelihood of only going higher over time — have come together in alignment to spur serious, government-backed efforts at finding a cost-effective technology capable of generating clean, renewable electricity derived from the natural temperature gradient that exists deep throughout the world’s oceans. Besides the technological and economic hurdles, the ecological impacts of OTEC systems remain uncertain. Described in a [2011 environmental report on OTEC](http://hinmrec.hnei.hawaii.edu/wp-content/uploads/2010/01/Environmental-Assessment-of-OTEC-in-Hawaii1.pdf) as “an unprecedented environmental modification [that] must be rigorously evaluated,” the daily flow of a 5 MW pilot OTEC plant has been estimated at more than 2 million cubic meters of water. A focal point in this regard is the biological and ecological effects of pumping and discharging massive volumes of nutrient-rich deep ocean water up to near surface depths. One cause for concern is the potential for this to result in phytoplankton blooms. Another is the potential entrapment and mortality of organisms in OTEC system intake pipes. A simulation and analysis performed by O’ahu’s [Makai Ocean Engineering](http://www.makai.com/) recently published by the Department of Energy (DOE) indicates that perturbations resulting from operation of a 100MW OTEC plant in the waters off O’ahu would not have significant impacts on phytoplankton reproduction. The Making of Makai’s Bio-physical OTEC Model Makai Ocean Engineering has been involved in OTEC research and development since way back in the late 1970s. In late September this year, the DOE published a [technical report](http://www.osti.gov/bridge/product.biblio.jsp?query_id=1&page=0&osti_id=1055480)describing the modeling Makai has done in simulating the “biochemical effects of the nutrient-enhanced seawater plumes that are discharged by one or several 100 megawatt (MW) OTEC plants.” In order to simulate the biochemical response for three classes of phytoplankton, Makai’s biological and physical model entailed setting up grid cells with three-hour time steps for the waters surrounding O’ahu, in conformance with the [Environmental Fluid Dynamics Code (EFDC)](http://www.epa.gov/athens/wwqtsc/html/efdc.html) approved by the EPA. Makai calibrated the dynamic biological phytoplankton model using data collected for the [Hawaii Ocean Time Series (HOTS)](http://hahana.soest.hawaii.edu/hot/hot.html) project and then had it peer reviewed. The physical oceanography model component made use of “boundary conditions from a surrounding [Hawai’i Regional Ocean Model](http://apdrc.soest.hawaii.edu/REGMOD/)(HROM) operated by the University of Hawai’i and the National Atmospheric and Oceanic Administration (NOAA).” Makai ran its model for a “100 MW OTEC plant consisting of four separate ducts discharging a total combined flow rate of 420 cubic meters/second of warm water and 320 m3/s of cold water in a mixed discharge” at a depth of 70 meters. At this depth, the HOTS system observations indicate concentrations of phytoplankton at a density of 10-15 mg of carbon per cubic meter, according to the technical report. The Results After first running simulations without the OTEC system in order to calibrate its model with the HOTS system, Makai ran the simulation with the addition of the model for the 100MW OTEC plant. The researchers, among other things, found that, “because this terminal near-field plume is well below the 1% light limited depths (~120m), no immediate biological utilization of the nutrients occurs. They explain that, “As the nitrate is advected and dispersed downstream, a fraction of the deep ocean nutrients (< 0.5 umol/kg perturbation) mix upward where they are utilized by the ambient phytoplankton population.” They found that this occurs around 25 kilometers downstream from the plant at 110–70 meters depth. For pico-phytoplankton, the modeling results indicated that “this nutrient perturbation causes a phytoplankton perturbation of approximately 1 mgC/m3 (~10% of average ambient concentrations) that covers an area 10×5 km in size at the 70 to 90m depth.

#### OTEC harms ocean environment

Vega and Comfort 11

Christina M. Comfort and Luis Vega, Ph.D. Hawaii National Marine Renewable Energy Center Hawaii Natural Energy Institute University of Hawaii at Manoa Environmental. “Assessment of Ocean Thermal Energy Conversion in Hawaii” <http://hinmrec.hnei.hawaii.edu/wp-content/uploads/2010/01/Environmental-Assessment-of-OTEC-in-Hawaii1.pdf> (Merkley)  
The operation of OTEC will impact organisms inhabiting or moving through the area to an unknown degree. Scientists have identified a list of potential biological impacts, including nutrient redistribution, entrainment and impingement, organism attraction or avoidance, and biocide release, among others [3]. To understand OTEC’s ecological impact, long-term monitoring protocols are necessary to track primary productivity, animal abundance and density, habitat use, and entrainment rates. As with any offshore operation, the plant is likely to attract fish and seabirds, noise may interfere with animal communication, and lubricants or anti-biofouling chemicals may enter the ocean. Specifically concerning OTEC, the redistribution of millions of cubic meters of water per day will change stratification, salinity, oxygen, and nutrient levels near the site. Some organisms base their behavior on certain temperature or salinity gradients, e.g. [10], while others may be affected by increased nutrient levels [18]. Additionally, plankton and small nekton will be entrained in the water flow in both the shallow and deep intake pipes, and will likely suffer high mortality rates due to rapid temperature and pressure changes [4]. Organisms could be impinged against screens on the shallow water intakes if their burst swimming capacity does not overcome the current generated by the pipe [2, 3].

#### OTEC damages the marine environment

Vega 99

<http://www.otecnews.org/portal/otec-articles/ocean-thermal-energy-conversion-otec-by-l-a-vega-ph-d/> OTEC overview, by L.A. Vega, Ph.D. “Ocean Thermal Energy Conversion (OTEC)” by L. A. Vega, Ph.D. 1999 (Merkley)

Marine discharges will depend on the working fluid, the biocides, the depth of intake and the discharge configuration chosen. Other potentially significant concerns are related to the construction phase. These are similar to those associated with the construction of any power plant, shipbuilding and the construction of offshore platforms. What is unique to OTEC is the movement of seawater streams with flow rates comparable to those of rivers and the effect of passing such streams through the OTEC components before returning them to the ocean. The use of biocides and ammonia are similar to other human activities. If occupational health and safety regulations like those in effect in the USA are followed, working fluid and biocide (most probably anhydrous ammonia and chlorine) emissions from a plant should be too low to detect outside the plant sites. A major release of working fluid or biocide would be hazardous to plant workers, and potentially hazardous to the populace in surrounding areas, depending on their proximity. Both ammonia and chlorine can damage the eyes, skin, and mucous membranes, and can inhibit respiration. Should an accident occur with either system, the risks are similar to those for other industrial applications involving these chemicals. Ammonia is used as a fertilizer and in ice skating rink refrigeration systems. Chlorine is used in municipal water treatment plants and in steam power plants. Chlorine can be generated in situ; therefore storage of large quantities of chlorine is not recommended. Organisms impinged by an OTEC plant are caught on the screens protecting the intakes. Impingement is fatal to the organism. An entrained organism is drawn into and passes through the plant. Entrained organisms may be exposed to biocides, and temperature and pressure shock. Entrained organisms may also be exposed to working fluid and trace constituents (trace metals and oil or grease). Intakes should be designed to limit the inlet flow velocity to minimize entrainment and impingement. The inlets need to be tailored hydrodynamically so that withdrawal does not result in turbulence or recirculation zones in the immediate vicinity of the plant. Many, if not all, organisms impinged or entrained by the intake waters may be damaged or killed. Although experiments suggest that mortality rates for phytoplankton and zooplankton entrained by the warm-water intake may be less than 100 percent, in fact only a fraction of the phytoplankton crops from the surface may be killed by entrainment. Prudence suggests that for the purpose of assessment, 100 percent capture and 100 percent mortality upon capture should be assumed unless further evidence exists to the contrary. Metallic structural elements (e.g., heat exchangers, pump impellers, metallic piping) corroded or eroded by seawater will add trace elements to the effluent. It is difficult to predict whether metals released from a plant will affect local biota. Trace elements differ in their toxicity and resistance to corrosion. Few studies have been conducted of tropical and subtropical species. Furthermore, trace metals released by OTEC plants will be quickly diluted with great volumes of water passing through the plant. However, the sheer size of an OTEC plant circulation system suggests that the aggregate of trace constituents released from the plant or redistributed from natural sources could have long-term significance for some organisms.

### OTEC: Algal Blooms scenario

#### Algal blooms cause mass extinctions – empirics prove

Rettner 09

<http://www.livescience.com/5835-recipe-mass-extinction-add-algae-stir-controversy.html> Recipe for Mass Extinction: Add Algae and Stir Controversy [Rachael Rettner](mailto:rrettner@imaginova.com) | October 29, 2009 10:50am ET Rachael Rettner Rachael has masters degree in journalism from New York University's Science, Health and Environmental Reporting Program. She also holds a Bachelor of Science in molecular biology and a Master of Science in biology from the University of California, San Diego. (Merkley)

Mass extinctions that wiped entire species off the face of the Earth in a relative blink of the eye are often blamed on catastrophic occurrences, such as an asteroid crash or large volcanic eruption. But a new hypothesis points to a different culprit: lowly algae. In the past 540 million years, [five massive extinctions](http://www.livescience.com/1752-greatest-mysteries-mass-extinctions.html) are thought to have killed off, in each case, some 50 percent to 90 percent of animal species. A new study suggests that toxins from algae played a major role in all five extinctions, including the most recent and most well-known – the [death of the dinosaurs](http://www.livescience.com/2038-double-trouble-killed-dinosaurs.html) 65 million years ago. The idea was presented at the annual Geological Society of America meeting Oct. 19. But could primitive algae really have taken down the dinosaurs? Well, the jury is still out, though some scientists are skeptical of the algae-killing idea, saying evidence is at best lacking and to point the finger at just one culprit for one mass extinction, let alone five, makes little sense. And while no one can ever know for certain what caused these extinctions, some theories are more accepted than others. For instance, most scientists think an asteroid impact was the major factor in the dinosaur extinction, while a volcanic eruption was a big contributor to the [Permian extinction](http://www.livescience.com/3807-global-warming-worst-mass-extinction.html), the largest of the five. As of now, the killer-algae hypothesis doesn't fit into the "accepted" category. Toxic algae Algae are simple organisms that get their energy from the sun and lack many features found in plants, such as roots and leaves. Some algae species produce toxins that are harmful to other aquatic organisms and even us. For instance, one group of algae called dinoflagellates can release neurotoxins that act on nerve cells. When nutrients abound, the algae and other primitive microbes can grow rapidly and can aggregate to form dense populations, known as algae blooms. Such outbreaks of toxic algae can have devastating effects on ecosystems, killing fish, birds, marine mammals and even people. The most problematic group of toxin-producers are cyanobacteria, commonly known as blue-green algae. While cyanobacteria are not technically algae – they were reclassified from algae to bacteria – they can produce their own energy from the sun, and some researchers still place them in the algae group. Also, their "blooms," which cover the water with a blue-green film, are referred to as algal blooms. Clemson University researchers James Castle, a geologist, and John Rodgers, an environmental toxicologists, wanted to find out if such algal blooms that are harmful today could have posed a threat millions of years ago and possibly contributed to extinctions. First, they did a literature search, turning up reports of an increase in fossilized stromatolites, or dome-shaped rocks with layers of cyanobacteria known as "microbial mats," during four out of five of the mass extinctions. Then, the team compared the structure of modern-day cyanobacteria with ancient cyanobacteria, finding the species had not changed much over millions of years. "Since they've changed very little in their structure, and they make toxins today, we propose that they did so in the past," said Castle. While they didn't find an increase in fossilized algae at the time of the dinosaur extinction, the authors suggest that another form of algae, one that doesn't leave fossils behind, could have contributed to that extinction. They suggest so-called planktonic algae, which produces toxins in the soil, could have found its way into the animals' diets. The toxins can also become airborne, providing another way to poison species. Kill mechanism The new hypothesis does not single out algae as the only extinction factor, said Castle. Instead, they view the algae as what they call a "kill mechanism," a way for environmental change to contribute to increased death. "The toxins tend to become stronger and released when there's something that stresses the algae, [such as] a change in salinity of the water, a change in temperature," said Castle.

#### Algal blooms cause mass extinctions – empirics prove

Rodgers 09

<Http://www.npr.org/templates/story/story.php?storyId=114081479> Dr. JOHN RODGERS (Professor of Forestry and Natural Resources, Clemson University; Director, Ecotoxicology Program Did Algae Contribute To Mass Extinctions? October 23, 2009 1:00 PM ET (Merkley)

Up next, a new theory about how the dinosaurs became extinct. Forget volcanoes, asteroids, rising sea levels. The real reason is killer algae, or at least that's according to a new theory by two Clemson University researchers. Joining me now to talk about this idea is one of those Clemson scientists. John Rodgers is professor of forestry and natural resources, and the director of the ecotoxicology program at Clemson University in South Carolina. Welcome to SCIENCE FRIDAY. Dr. JOHN RODGERS (Professor of Forestry and Natural Resources, Clemson University; Director, Ecotoxicology Program): Good afternoon. PALCA: So what brought you to this theory of algae as being, you know - because we know that there are certain toxic algae, I'm - I grant you. But algae that are toxic enough to cause mass extinctions? Dr. RODGERS: Well, as an ecotoxicologist, part of my life is spent studying algae and algal blooms and so-called harmful algal blooms. And in partnership with my colleague, Jim Castle, who's a geologist, one day we started talking about the notion that many of the algal blooms that we were seeing were becoming more widespread. The toxins were becoming more intense. Their potency was becoming more intense. Their production was very high so they were consuming lots of oxygen. And he said, well, this is - this certainly has application in terms of mass extinction. So we started scouting out the literature and found out that other scientists had offered the notion that certainly algae could cause local mass extinctions. And then we expanded from there to looking globally and said, there are quite a few mass extinctions that have happened in the past that we can relate to algal production as well as the examples from the current research that we're doing. So there were examples from the past as well as current examples ongoing. And that sort of led to the development of that hypothesis. PALCA: Interesting. And I want to invite our listeners to ask questions about this as well. The number is 800-989-8255. So, now, I'm wondering how would you go about proving this or substantiating it? Dr. RODGERS: Well, as all scientists would, we would certainly set about to test this hypothesis. And our initial test involved looking at the rock record at the major mass extinctions from the past. In the past, there have been five major mass extinctions that have been recognized by paleontologists and geologists and so on. And so, we initially carefully looked at those mass extinctions and started asking questions about, did this correlate or did these mass extinctions correlate with the presence of fossil algae? Or was there evidence of algal blooms and algal toxicity in the rock record? And as we looked hard at that, sure enough, there was. PALCA: So you're actually seeing at the same time that the number of different species are going down, the sheer numbers of algae are going up? Dr. RODGERS: Yes. And there are actually several ways that these algae can get you. The two, probably, most important ones are the production of toxins that we talk about a lot. And then, the other way is the anoxia that many geologists and geoscientists have noted. They have noted that in the formation of certain shales and so on, certain algal shale - that there was apparent anoxia. And that's one of the things that algae are good at. PALCA: Anoxia, maybe you can explain that. Dr. RODGERS: Well, when these algae die, as they produce these massive blooms that are - they have a lot of organic carbon. They're very readily biodegradable. As these algae die, they consume quite a bit of oxygen. And actually, they can consume enough oxygen so the waters simply go anoxic, sort of like the anoxic area out in the Gulf of Mexico off of the mouth of the Mississippi River. PALCA: Right. These - what we sometimes call dead zones? Dr. RODGERS: Exactly. PALCA: I see. So, you're suggesting that there's two mechanism. What kind of toxins - I mean, would you just say that the - they don't - there weren't more toxic algae there just were a lot more of them, and together, they were, you know, largely toxcious(ph) just by their numbers? Dr. RODGERS: Well, certainly, that - both of those are possibilities. In other words, that the toxins they were producing were potent, and changed their potency because we see that currently, that algae have a capability of producing or changing the potency of their toxins. Sometimes, they have the ability to turn on or turn off production of toxins as a result of environmental cues. And then, these toxins that we see are things like neurotoxins, as well as other liver toxins, hepatotoxins and so on. And so, we see a variety of toxins ranging all the way from cyclic peptides to alkaloids. So, we see a whole variety of toxins produced currently, and now, it's time to go to the rock record and see what we can find in terms of residuals of those. PALCA: We're talking with John Rodgers of Clemson University about a new theory he's published this week in PNAS journal about algae possibly being a cause of mass extinctions. I'm Joe Palca, and this is SCIENCE FRIDAY from NPR News. So, in the introduction, I mentioned that you were an ecotoxicologist. What does an ecotoxicologist do actually? Dr. RODGERS: Well, as ecotoxicologists, we're interested primarily in the same thing that other traditional biologists might be interested in. If we back away from science and look at science, much of science is involved with stimulus and response. So the stimuli that an ecotoxicologist would be interested in would be those chemical, physical and biological entities in our environment that may pose risk, or have the potential to cause harm. PALCA: I see. And are you seeing anything in today's ecosphere that would give you concern about perhaps killer algae… (Soundbite of laughter) PALCA: …forgive my use of the phrase, but algae being a danger at this point? Dr. RODGERS: Well, it's interesting that you used the term killer algae because some of our friends in Spain and Russia have used the term assassin algae. So that's not too far-fetched. Around the globe, we're seeing extinctions of invertebrates. We're seeing the extinctions of fish. We're seeing attacks on birds and extinctions of birds, other wild animals such as monkeys and the rhinoceros on other continents. We're seeing plants declining as a result of these toxins, and impacts on domestic animals like cattle, sheep and dog. PALCA: I should correct something I said earlier. This paper that you published was not in PNAS but in Environmental Geosciences. And I apologize for getting that wrong. Dr. RODGERS: Thank you. (Soundbite of laughter) PALCA: Okay. Let's take a call now and go to Matt(ph) in Wyoming. Matt, welcome to SCIENCE FRIDAY. You're on the air. MATT (Caller): Hi. I just had a question. How long would it take for an algae to evolve again to be deadly? And could it happen again? PALCA: Hmm. Well, that - yeah, that - we were sort of just discussing that. Is this something that we could see again, do you think? Dr. RODGERS: Well, I think this is something that we certainly proposed. A lot of these algal - rapid algal growths and a lot of the mass extinctions are also correlated with global climate change.

## Renewables

### Link – Renewables 1NC

**Ocean Renewables harm the ocean environment and kills the chance of warming solvency**

**Ling et al 10**

Wei Xu1, Feng Li1, Ou Ling1, Wenhai Lu2, Xu Li1 National Ocean Technology Center, No.219 Jieyuanxidao Road, Nankai District, Tianjin, P.R. China National Marine Data and Information Service,No.93 Liuwei Road, Hedong District, Tianjin, P.R. China <http://tethys.pnnl.gov/sites/default/files/attachments/EIMR2014_141_Wei.pdf> (Merkley)

**The marine environment will be affected seriously during ocean renewable energy project construction period** and equipment removal period, and the impact mode and results of these two periods are similar. When the project construction is ended, the disturbance on the ocean environment is reduced gradually, the impact on the environment is gone gradually also. **These effects include noise, suspended substances, light pollution and chemical leaks. The structures will** 2 **occupy the habitats on the sea, result in permanent loss of marine life and habitats. The impact of the equipment in operation period is more complicated. Many of the projects lead to individual behavior change**, such as communication, reproduction, orientation, prey and predator sensing and migratory, and main objects affected include fish, birds, mammals and benthic organisms. After that, Due to the long-term working period over 10 years, the **Ocean Renewable energy project will have an impact on the seasonal activities of the species, also change the** hydrodynamic force, **ecological environment and other conditions for a long time, and result in the spatial-temporal change of regional eco-environment.**

## Tide Power

### Tide Energy 1NC

#### Tidal turbines damage the marine environment

Haluzan 12

TUESDAY, NOVEMBER 13, 2012 “[The environmental impact of using wave and tidal energy](http://hydroearth.blogspot.com/2012/11/wave-and-tidal-energy-environmental.html)” Ned Haluzan: My name is Ned Haluzan, and I'm the sole author of all articles that can be found at www.renewables-info.com. I have been actively involved in environmental sciences and renewable energy for more than a decade. As of late I'm actively involved in renewable energy consultancy, but of course I still continue to write for renewable energy articles whenever I have the opportunity. (Merkley)

The environmental impact of wave and tidal energy is still pretty much in unknown territory, simply because these two energy sources are yet to move beyond the stage of prototype projects used for demonstration purposes and become widely deployed technologies. The possible negative environmental effects of tidal and wave power include: - the frames of the turbines could lead to disruption in movement of large marine animals and ships through the channels on which the barrage is built - construction of tidal power plant can also disrupt fish migration in the oceans, and even kill fish population when passing through the turbines. - the possibility of noise pollution UK is currently the global leader in developing marine energy technologies so it is really no surprise that UK has recently launched first seabed sonar that should measure the environmental effects of tidal and wave power at couple of domestic test sites. The two state-of-the-art sonar systems will monitor fish and diving seabirds that pass through or feed within the location, with the special emphasis on how fish and seabirds interact with wave and tidal power installations. Once deployed, marine and wave power technologies change water flow and turbulence, and scientists want to know how these changes impact marine wildlife, namely whether their environment impact is minimal or not. These sonars will give scientists precious info on how fish and birds act around different marine renewable energy devices, and will give them an answer about the possible risk of collision between marine wildlife and installed turbines (tidal power is renewable energy that comes from tidal currents and is generated by using turbines in the tidal flow). Tidal and wave resources have great potential to become important renewable energy sources in years to come. These two sources are predictable and this gives them an important advantage over solar and wind. However, before widely deploying wave and tidal energy technologies it is important to study their environmental impact. The current environmental condition of our planet is anything but good and therefore only environmentally friendly energy sources should be developed further. Tidal and wave power certainly look promising from environmental point of view, but it is still too early to come up with accurate conclusions. Not without the further research.

## Wave Power

### Wave Power 1NC

#### The magnetic fields of the wave power generators damage marine animals’ ability to survive

Mahoney 10

“Animal magnetism: how wave, tidal energy devices affect sea life” <http://www.smartplanet.com/blog/intelligent-energy/animal-magnetism-how-wave-tidal-energy-devices-affect-sea-life/> By [Melissa Mahony](http://www.smartplanet.com/meet-the-team/melissa.mahony/) Contributing Editor Melissa Mahony has written for Scientific American Mind, Audubon Magazine, Plenty Magazine and LiveScience. Formerly, she was an editor at Wildlife Conservation magazine. She holds degrees from Boston College and New York University's Science, Health, and Environmental Reporting Program. She is based in New York. September 2010 (Merkley)

As more projects go to sea for renewable energy sources, questions of how wave and tidal power devices might affect marine life are bound to surface. This week at the "[Oceans 2010](http://www.oceans10mtsieeeseattle.org/)" conference in Seattle, scientists from the [Pacific Northwest National Laboratory (PNNL)](http://www.pnl.gov/) are discussing how they're looking into some of them. I've written earlier about efforts to see whether [noise might safely dissuade whales from swimming into wave power buoys](http://www.smartplanet.com/business/blog/intelligent-energy/whales-and-wave-power-bringing-the-noise-to-avoid-collisions/1532/) off Oregon's coast. The focus of these researchers is electromagnetic fields. Many marine species—sea turtles, crabs, sharks, skates, salmon and other fish—rely on Earth's magnetic fields for migrating or searching for food. The many iterations of wave, tidal and hydrokinetic power devices, and the cables that bring the electricity they generate to shore, produce similar electromagnetic fields. PNNL's Jeff Ward, a marine ecologist, says in a [statement](http://www.sciencedaily.com/releases/2010/09/100920101149.htm): We really don't know if the animals will be affected or not. There's surprisingly little comprehensive research to say for sure. Much of the data that does exist has been conducted in other parts of the world, such as [Sweden](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VMY-4XTWVFB-3&_user=10&_coverDate=05%2F31%2F2010&_rdoc=1&_fmt=high&_orig=search&_origin=search&_sort=d&_docanchor=&view=c&_searchStrId=1468071099&_rerunOrigin=google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=ce95c93954bfb73a4a5116f41c9616ef&searchtype=a), with other sets of sea creatures. To determine how magnetic fields influence animals in American waters, the scientists will place two Helmholtz coils (right), consisting of 200 pounds of copper each, next to aquariums holding different marine species. In their two-year long study, which began over the summer, they will turn the coils on and off at varying intervals and strengths, and observe how the species react. According to the researchers, the 0.1 to 3 milliTeslas of magnetic flux that the coils can produce is relatively small compared to other studies on electromagnetic fields and sea life. How this compares to fields given off by the energy devices was not given, but understanding the influence of even slight changes in electromagnetic fields on the animals is important. Some of the circumstances and behaviors the study will investigate are: The ability of juvenile Coho salmon to spot and avoid predators The Dungeness crab's ability to quickly flick its antennules to detect odors Whether the electromagnetic fields repel or attract certain species How hydrokinetic devices in rivers affect freshwater wildlife ([Oak Ridge National Laboratory](http://www.ornl.gov/)) The affect of electromagnetic fields on crabs ([Northwest National Marine Renewable Energy Center](http://depts.washington.edu/nnmrec/)) If the species studied do exhibit changes in their behavior, future research may expand out of the lab and into the sea where pilot projects are underway.

### Wave Power 2NC

#### Wave power damages the environment

Ma 08

<http://seattletimes.com/html/localnews/2008399727_oceanenergy17m.html> ” Concerns emerge about environmental effects of wave-energy technology” 2008, Michelle Ma: Talent Acquisition Manager China at DSM China, Harbin University (Merkley)

Developers also plan to monitor the project for effects on wildlife and shoreline habitat, keeping an eye on federally listed species such as the marbled murrelet, a small bird that dives for food. Finavera doesn't intend to continue the project after its five-year license expires. Still, if the company can negotiate a purchasing agreement with the Clallam County Public Utility District, homes in the area could use the wave-generated power while the project is in the water, Clark said. The Makah Nation wants to see what effect the project might have on the environment before deciding whether wave energy is a viable long-term option, said Ryland Bowechop, tourism and economic-development planner for the tribe. The buoys would sit just offshore from the tribal headquarters in Neah Bay. "We are always concerned because our livelihood is the ocean," Bowechop said. Concerns linger The environmental effects of wave and tidal energy are largely unknown and require more studies, dozens of scientists concluded after meeting a year ago at OSU's Hatfield Marine Science Center in Newport, Ore. The group was concerned that electromagnetic cables on the ocean floor could affect sea life, and that buoys could interfere with whale and fish migration. Large buoys might actually attract more fish, but the marine ecosystem could be altered if more predators move in. Buoys also could disrupt natural currents and change how sediment is moved. Shorelines might be affected as energy is taken from the waves. Even if environmental concerns are checked, costs to extract the power remain high. Wave energy costs at least 20 cents per kilowatt hour to generate, compared with 4 cents per kilowatt hour for wind power, said Annette von Jouanne, leader of OSU's wave-energy program. Wind energy used to be much more expensive 20 years ago. In comparison, coal-generated power costs about 5 cents per kilowatt hour, and power from dams can be as low as 3 cents, said Roger Bedard,

#### Wave energy damages the environment

Howell 10

By KATIE HOWELL of [Greenwire](http://www.greenwire.com/) Published: February 24, 2010 “Wave Technologies Could Harm Marine Resources -- DOE Study” <http://www.nytimes.com/gwire/2010/02/24/24greenwire-wave-technologies-could-harm-marine-resources-95837.html> Energy reporter for [Greenwire](http://www.eenews.net/gw/), an online news service that covers the environment and energy policy. (Merkley)

Energy technologies that tap waves and tides could disrupt marine resources, the Energy Department found in a recent study. Marine and hydrokinetic technologies that capture energy from waves, tides and currents are poised to make a significant contribution to U.S. power supplies, but there is little known about their environmental impacts, the [study](http://www1.eere.energy.gov/windandhydro/pdfs/doe_eisa_633b.pdf)(pdf) says. "There are well over 100 conceptual designs for converting the energy of waves, river and tidal currents and ocean temperature differences into electricity," the Office of Energy Efficiency and Renewable Energy report says. "However, because the concepts are new, few devices have been deployed and tested in rivers and oceans. Even fewer environmental studies of these technologies have been carried out, and thus potential environmental effects remain mostly speculative." But those effects could be significant. The report suggests projects could displace bottom-dwelling plants and animals or change their habitats by altering water flows and waves. And noise generated during installation and operation of energy conversion devices could interfere with communications of marine animals.

# Internals

## Keystone Species

### Invertebrates

#### The lack of ocean invertebrate biodiversity devastates marine ecosystems.

Dept of Conservation 94 – the state sector organisation which deals with the conservation of New Zealand’s natural and historic heritage, “The Importance of Invertebrate Biodiversity: An Otago Conservancy Review,” 1994, http://www.doc.govt.nz/documents/science-and-technical/casn053.pdf

In Otago, as elsewhere in New Zealand, invertebrates are found from the coast to the nival (above summer snowline) zone on the highest mountains. They are not only characteristic of all the plant communities present, but by their differential grazing of various plants strongly determine the plant species mix. Their seed and seedling eating habits are important in maintaining the integrity of communities by eliminating intruders which would usually arrive in very small numbers compared to the large number of seeds/seedlings produced by the resident plants. In this way, intact native communities can resist invasive weeds, unless the process is disrupted by man in the form of tracking, burning, stock grazing, etc. Table 2 summarises the importance of invertebrates to sustaining plant communities. Invertebrates are important in the soil for aeration, decomposition of dead plant material to create an organic layer and consequent release of nutrients which are then available for living plants, and assisting with formation of soil structure. In the absence of leaf litter feeders our grasslands, shrublands and forests would be rapidly choked up with litter and die within months. Insects, together with some micro-organisms such as fungi, are the only terrestrial organisms able to break down cellulose, the basic material of plants. Higher animals would also disappear quickly in the absence of these recycling invertebrates and the world would quickly return to that of a billion years ago when only bacteria and algae existed. Aquatic invertebrates, apart from being prey for native fish, are important in the flow of energy in water systems. They utilise the flow of micro-organisms together with feeding on mosses, dead vegetation and the periphyton layer on rocks, while other species are predatory. Adult invertebrates, particularly flying insects, serve a very important role in the pollination of plants, while their larvae often form complex relationships with their host plant or animal, feeding on them in such a way that both benefit. New Zealand has a rich invertebrate fauna of leaf-litter and this is reflected in Otago also, from high-alpine grassland through forests to coastal wetlands and dunes. Characteristic groups of this niche are minute snails, small beetles, moth larvae, spiders and mites, amphipods, millipedes and earthworms.

#### Marine invertebrates are crucial to marine ecosystems.

Covich, Palmer and Crowl 99 – Alan P., Margaret A., Todd A., Professor in the Department of Fishery and Wildlife Biology at Colorado State University, Professor in the Department of Biology at the University of Maryland, An associate professor in the Department of Fisheries and Wildlife and the Ecology Center at Utah State University, Oxford Journals, "The Role of Benthic Invertebrate Species in Freshwater Ecosystems: Zoobenthic species influence energy flows and nutrient cycling," 1999, http://bioscience.oxfordjournals.org/content/49/2/119.full

Benthic species perform a variety of functions in freshwater food webs. First, as already described, benthic invertebrates provide essential ecosystem services by accelerating detri-tal decomposition (van de Bund et al. 1994, Wallace and Webster 1996). Dead organic matter is one of the main sources of energy for benthic species in shallow-water habitats (Covich 1988, Hutchinson 1993, Wallace and Webster 1996). Benthic invertebrates are estimated to process 20–73% of riparian leaf-litter inputs to headwater streams. Second, benthic invertebrates release bound nutrients into solution by their feeding activities, excretion, and burrowing into sediments (Figures 1 and 2). Bacteria, fungi, algae, and aquatic angiosperms can quickly take up these dissolved nutrients, accelerating microbial and plant growth (van de Bund et al. 1994, Cummins et al. 1995, Pelegri and Blackburn 1996, Wallace et al. 1997). This increased growth of benthic microbes, algae, and rooted macrophytes is in turn consumed by herbivorous and omnivorous benthic invertebrates (Creed 1994, Lodge et al. 1994, Nystrom et al. 1996, Cronin 1998). Third, many benthic invertebrates are predators that control the numbers, locations, and sizes of their prey (Crowl and Covich 1990, 1994). Fourth, benthic invertebrates supply food for both aquatic and terrestrial vertebrate consumers (e.g., fishes, turtles, and birds). Finally, benthic organisms accelerate nutrient transfer to overlying open waters of lakes (e.g., Lindegaard 1994, Threlkeld 1994, Blumenshine et al. 1997, Clarke et al. 1997) as well as to adjacent riparian zones of streams (e.g., Covich et al. 1996, Johnson and Covich 1997, Naiman and Decamps 1997, Wallace et al. 1997). The extent of understanding of the effects of benthic organisms on freshwater ecosystem processes varies with the type of freshwater system (i.e., streams, lakes, and wetlands). For example, much more is known about how benthic species of aquatic insects and other consumers influence detrital processing in streams than about how they do so in lakes or wetlands (Hutchinson 1993, Wallace and Webster 1996, Rosemond et al. 1998). Species-specific linkages are known to enhance algal growth and productivity (Dodds 1991, Pringle et al. 1993), and field experiments are beginning to show that benthic macroinverte-brates have species-specific roles in processing organic matter. For example, one species of freshwater shrimp can process leaf litter faster than another shrimp species in an insular tropical headwater stream (see discussion below). Although both shrimp are detritivores, they do not substitute completely for one another in leaf-detrital processing and nutrient cycling. In stream reaches where both of these shrimp species co-occur (Covich and McDowell 1996), their interactions and different modes and rates of leaf-litter processing may enhance each other's effectiveness. Previous Section Next Section Different benthic species alter rates of decomposition If sufficient dissolved oxygen and appropriate substrata are available, then many species of benthic organisms, especially insects and crustaceans, can accelerate microbial processing of dead organic material. Because many species process organic detritus, most freshwater ecolo-gists have generally categorized these consumers into functional feeding groups (Cummins et al. 1995) or feeding guilds (Hawkins and MacMahon 1989). To simplify data collection and analyses, most investigators “lump” species, making the assumption, for example, that those with similar feeding appendages or mandibular morphology generally perform similar roles in processing leaf litter (Merritt and Cummins 1996). Although ecologists still disagree about how to best categorize different species (e.g., Wallace and Webster 1996), it is widely agreed that shredders feed by tearing up large pieces of microbially conditioned leaf detritus with specialized mouth parts, whereas scrapers feed on attached algae or “biofilms” of bacteria and algae. However, some species of scrapers also consume bacteria and fungi from fresh and decomposing leaf surfaces (Kornijow et al. 1995). As species scrape and shred coarse plant litter in the process of obtaining their food, they convert coarse litter into fine particulates. Collectors filter suspended organic particulates from flowing waters or from small, water-filled spaces within the sediments. Although these functional classifications are useful for some studies, they can obscure important food-web dynamics that result from differences among individual species and changes in feeding behavior under specific conditions.

#### Benthic invertebrates are a keystone species because they provide habitats for numerous organisms

Fabry et al 8 - Victoria J., Brad A., Richard A., James C., Ph. D. biological oceanographer whose research interests encompass the role of marine organisms in geochemical cycles, Oxford Journals, “Impacts of ocean acidification on marine fauna and ecosystem processes”, 2/14/, http://icesjms.oxfordjournals.org/content/65/3/414.full

Nine multicellular invertebrate phyla have benthic representatives with CaCO3 skeletal hard parts (Lowenstam and Weiner, 1989). These taxa secrete CaCO3 in the form of aragonite, calcite, high-magnesium calcite (>5 mole % MgCO3), amorphous CaCO3, or a mixture of these CaCO3 phases. Amorphous CaCO3 is less stable than the crystalline phases of CaCO3, and the seawater solubility of high-magnesium calcite is similar to or greater than that of aragonite (Walter and Morse, 1985; Bischoff et al., 1987). Many benthic calcifying fauna are prominent in nearshore communities and are economically and/or ecologically important. For example, bivalves, such as mussels and oysters, have high commercial value as fisheries and are also important as ecosystem engineers in coastal areas, providing habitat and other services for a rich diversity of organisms (Gutiérrez et al., 2003). Recent work suggests that benthic adult molluscs and echinoderms are sensitive to changes in seawater carbonate chemistry. In response to an elevated pCO2 level projected to occur under the IS92a emissions scenario (∼740 ppmv in 2100), calcification rates in the mussel Mytilus edulis and the Pacific oyster Crassostrea gigas decreased by 25 and 10%, respectively (Gazeau et al., 2007). When grown for more than six months in seawater bubbled with air containing 560 ppmv CO2, a decrease in shell growth was observed in the edible snail Strombus luhuanus, and a reduction in wet weight was reported in both this snail and two species of sea urchins (Shirayama and Thorton, 2005).

#### Benthic invertebrates are keystone species

COSEE 12 – Center For Ocean Services Education Excellence, aims for a better understanding of the key role the ocean plays in global environmental cycles by promoting partnerships between research scientists, “Beneath The Surface: Explorations in Benthic Ecology,” June, http://cosee.umaine.edu/programs/webinars/benthic/

Ocean sediments make up a critical marine habitat covering most of the ocean bottom – from shallow nearshore locations like estuaries to the deepest depths along the abyssal plains, and are one of the largest single ecosystems on the earth. Despite the size of this vast habitat, relatively little is known about its diverse and unique inhabitants. The mysteries of the organisms living within the ocean sediments are only now beginning to be revealed through the use of sophisticated technological tools. These “benthic” creatures and the systems in which they reside play crucial roles that affect the rest of the ocean ecosystem – including the recycling of nutrients, the burial and storage of organic matter, the fate and distribution of pollutants, and the reworking of sediments. Scientists like Sara Lindsay (University of Maine), Nils Volkenborn (University of South Carolina) and Anne Simpson (University of Maine) make use of advanced and rapidly-evolving technology to better understand the interconnected roles of these unique organisms as well as the impact that humans are having on this lesser known system.

### Salmon

#### Salmon is a keystone species

Helfield and Naiman 6 – James M., Robert J., degree in Doctor of Philosophy UW, Associate Professor Department of Environmental Sciences Huxley College of the Environment Western Washington, Ecosystems, “Keystone Interactions How Bears Influence Water Quality,” 2006, http://www.lmvp.org/Waterline/volume16number1/keystone.html

Keystone Species: Species of plants and animals that have a much greater effect on their environment and the community of organisms around them than their numbers would suggest. These species are called "keystone" species and removing them from their community can have profound implications. In some cases, two keystone species interact with one another and the result is even more profound. One such example of "keystone interactions" is the story of sockeye salmon and brown bears in the Alaska. The Role of Salmon: Salmon have an interesting life. They start out as fry in clear, typically nutrient-poor streams and eventually make their way to the ocean where they feed and grow. When the time comes for them to reproduce, they return to their hatching stream to spawn and then they die. The implications for their nutrient-poor streams are huge. Over millennia, nutrients have been washing downstream from higher elevations to eventually reach the sea. The salmon go to the ocean, collect nutrients by feeding, and eventually return nutrients (as body weight) to the streams. The returned nutrients provide food for numerous animals and plants in the stream, which in turn provide food for the salmon fry the following year. Even non-aquatic organisms benefit from the nutrients salmon bring upstream. For example, researchers studying naturally-occurring stable isotopes found that riparian (near the water) plants near spawning streams acquire up to 26% of the nitrogen in their foliage from salmon. Keystone The Role of Bears: Bears in one Pacific Northwest stream were found to kill, on average, approximately 37% of spawning sockeye salmon. Salmon carried out of the water to the forest floor near the stream are partially eaten and the carcass is left to rot. If salmon are abundant or easy to catch, the bears will eat a smaller proportion of the fish and leave more to rot than if fish are scarce or hard to catch. The salmon carcasses are carried away and broken down by scavengers and decomposers, further distributing the nutrients. Bears also distribute nutrients through waste excretion. Each adult female bear was shown to deliver about two-thirds of an ounce of nitrogen obtained from salmon per acre, primarily as urine. The scientist who collected that data must certainly have some interesting stories to tell. Urine is quickly converted to ammonium and becomes an available nutrient source for plants. Nutrient Movement: Nitrogen from salmon is distributed nearly one-third of a mile on each side of the spawning streams, with the carcasses primarily near the stream and bear waste more prevalent at the far end of that range. Nitrogen from salmon can even move through the ground in the hyporheic zone, or the area under the stream bed where ground water and surface water interact. Habitat Modification: Vegetation near spawning streams has elevated nitrogen content and is thus more desirable to animals such as moose and snowshoe hares. Riparian trees grow faster and denser when nutrient concentrations are higher and in the process stabilize the banks, filter sediment, shade the water and deposit debris. All these effects benefit the salmon fry which will eventually return as adults to contribute more nutrients to the stream system. Computer models of the study stream showed that, through their interactions, salmon and bear together contributed significantly more to the flow of nitrogen in the riparian zone than either species could accomplish individually. The bear/salmon interactions benefit multiple organisms in the ecosystem, including vegetation, plant-eating animals, scavengers, decomposers, and other fish species. The loss of either species would have serious, adverse environmental consequences, affecting many plants and animals in the stream community.

### Seabirds

#### The black oystercatcher, a seabird that lives in the OCS, is a keystone species

NPS 14 – National Park Service, U.S. Department of the Interior, “Black Oystercatcher,” 6/26, http://www.nps.gov/kefj/naturescience/black\_oystercatcher.htm

The black oystercatcher is a large shorebird that inhabits much of the coastal area of the western United States. It is very distinct, with a chicken-sized black body, bright red legs, and a long red beak (about 9 cm). It uses its beak to pry open the shells of mollusks, snails, and the other intertidal invertebrates on which it feeds. Living on secluded and rocky beaches, it can often be seen running in and out of the intertidal zone, looking for food that is left between the crashing of the waves. It is completely dependent on these beach and tidal areas for all aspects of its life (feeding, breeding, nesting, and raising its chicks). It is particularly sensitive to any disturbance and habitat changes in coastal areas, especially those caused by humans. Black oystercatchers are considered a "keystone" species because, as a top predator in the intertidal zone, they affect the number and types of species found in the ecosystem. Their predation of algae-eating snails causes ripples throughout the nearshore ecosystem, making the oystercatcher the "key" to understanding the composition of life in its environment. The black oystercatcher is considered a Management Indicator Species by the park's neighbor to the north, Chugach National Forest, and is a species of concern, both nationally and regionally. Kenai Fjords National Park has a history of conducting and supporting research and monitoring of black oystercatchers and has contributed significantly to the body of knowledge of this their life history. We began long term monitoring of black oystercatcher in 2007.

#### **Burrowing seabirds are also a keystone species.**

DOC 3 – Department of Conservation, the state sector organisation which deals with the conservation of New Zealand’s natural and historic heritage, “The return of the fairy prions to Mana Island,” November, http://www.doc.govt.nz/Documents/parks-and-recreation/places-to-visit/wellington/fairy-prion-transfer-factsheet.pdf

Although there are around a million pairs of fairy prion on Takapourewa (Stephens Island), they no longer breed on the Wellington side of Cook Strait. Fairy prions and other burrowing seabirds are ‘keystone’ species for island ecosystems. Their burrows create homes for lizards, tuatara and insects, and because they feed at sea and nest in colonies, they create very fertile ecosystems by delivering nutrients to the land in the form of droppings, spilt regurgitations, addled eggs and corpses.

### Seagrass

#### **Seagrass is a keystone species in regards to benthic invertebrates**

Gentry 6 – Rebecca, student at UCSB, graduated from Columbia University - Graduate School of Journalism, Earth and Environmental Science Journalism Science Research Project, Earth & Environmental Science Journalism Dual Master's Degree Program, “Beach Replenishment in Punta Cana, Dominican Republic: Effects on Seagrass, Benthic Invertebrates, Sediment, and Water Quality,” 1/19, https://www.ldeo.columbia.edu/edu/eesj/projects/Gentry.htm

Tropical near shore seagrass beds provide essential habitat, play an important role in nutrient cycles, and structure the sediment dynamics along the coast, yet the ecological effects of beach replenishment on seagrass beds is poorly understood. Ten sites along the coast of Punta Cana, Dominican Republic, were chosen and classified by the extent to which beach replenishment, in the form of nourishment (sand addition) and construction of groins and other structures to change sediment flow, have altered the sites. At each site, seagrass and benthic invertebrates were sampled along five transects that ran out to sea perpendicular to the shore. In addition, abiotic measures of water quality and sediment grain size were assessed. The sites most heavily altered had significantly less seagrass bed cover, invertebrate abundance, and richness, which indicate that these sites have reduced overall biodiversity. Moderately altered sites also had significantly less seagrass bed cover than the low alteration sites, suggesting that the effects of replenishment extend beyond the immediate areas where beach construction activities were located. There was a non-significant trend for offshore sediment grain size to increase in more intensely altered sites. Larger grain size might be due to the loss of seagrass, which slows the current, and traps fine particles. This physical change may be contributing to the slow return of both benthic invertebrates and seagrass to the highly altered sites. Seagrass is a keystone species in this near shore habitat; it greatly influences both the biological and physical environment. Health and productivity of the near shore zone is essential in maintaining clear water, sandy beaches, and an abundance of reef fish. More research needs to be done in order to learn the most effective ways of balancing continued development with protection of these vital resources.

### Sea Otters

#### **Sea otters are a keystone species in Japan, the California coast, and the Aleutian Islands**

Illman 96 – Deborah L., Interim Assistant to the Vice Provost for Research and serves on the faculty of the Department of Technical Communication in the College of Engineering at the University of Washington, a doctorate in chemistry, as well as a bachelor of science in chemistry, University of Washington, “Keystone Species Hypothesis,” November, http://www.washington.edu/research/pathbreakers/1969g.html

Put another way, a keystone species is one whose impacts on its community or ecosystem are large and greater than would be expected from its relative abundance or total biomass, explains Paine. Species that are known to play this role, besides the starfish mentioned above, include the sea otter, the freshwater bass, and the predatory whelk Concholepas (a kind of elongated sea snail). By contrast, trees, giant kelp, prairie grasses, and reef-building corals all have impacts that are large but not disproportionate to their total biomass, and therefore they are not keystone species. A good illustration of Paine's keystone species concept is provided by the sea otter, which formerly occupied a range extending from the northern Japanese archipelago, through the Aleutian Islands, down the coast of North America as far south as Baja California. The return of the sea otter to southern California, for example, is restoring kelp beds and associated marine life there. That's because one of the favorite delicacies of the otter is the large sea urchin, which in turn feeds on kelp. As the sea otter returns to its native territories, scientists expect the population of invertebrates, like urchins and abalone, for example, to decrease as marine plant biomass increases. In fact, a decrease in sport and commercial abalone fisheries was reported following an influx of sea otters into areas of California, causing a controversy there.

### Sharks

#### Sharks – including tiger sharks and whale sharks – are a keystone species because they are atop their food chain.

Rogers 12 – Kara, Britannica’s biomedical sciences editor, holds a Ph.D. in pharmacology and toxicology from the University of Arizona, is a member of the National Association of Science Writers, and has written for various publications on topics ranging from current medical research and eugenics to parasitic and vector-borne diseases, Encyclopedia Brittanica Blog, “Why Sharks Rule,” 8/13, http://www.britannica.com/blogs/2012/08/why-sharks-rule/

Many types of sharks are keystone species, meaning that they have disproportionately large effects on the ocean communities to which they belong. This is largely because they sit at the top of the food chain. By consuming slow or weak animals, they help keep prey populations healthy. Their predatory habits also help to maintain prey diversity within their communities, which in turn keeps primary producers and ecosystem processes in balance. Sharks also scavenge, feeding on dead animals, and there is evidence that prey avoidance of sharks plays a critical role in maintaining resources for a wide range of species. For instance, research in Australia has shown that intimidation by tiger sharks prevents species such as dugongs and green sea turtles from overgrazing on high-quality beds of seagrass, which enables bottom-dwellers in the seagrass community to thrive. Large filter-feeding sharks, such as the whale shark and basking shark, also have a tremendous impact on the communities they inhabit, even though they are much less aggressive than species like the great white and tiger shark. Filter-feeders gulp down enormous quantities of plankton. The whale shark is unique in that is combines suction with filter-feeding to draw in actively swimming animals like sardines and anchovies.

#### **Tiger sharks are a keystone species**

Hu 12 – Tricia, Oceana, founded in 2001, is the largest international organization focused solely on ocean conservation, “Sharks as a keystone species,” 2012, http://triciahusharkattack.blogspot.com/p/sharks-as-keystone-species.html

An important example of how sharks serve as the keystone species in a marine ecosystem is the tiger shark that directly influence the bottom sea grass community in Shark Bay, Australia. As the top predator, tiger sharks directly or indirectly limit the behavior and population of other species in the food web. Dugongs and green sea turtles are staples of the tiger shark diet and the presence of a shark intimidates these two species to graze lower quality sea grass near the patch edges and continually modifying their distribution. This allows the sharks to prevent overgrazing of the sea grass and preserving the benthic community which relies on the sea grass. Tiger sharks also influence the location and distribution of bottlenose dolphins even though they are rarely consumed by the sharks. In their presence, dolphins avoid feeding in the productive shallow waters. Once the sharks leave, dolphins and other piscivorous species are free to feed in all habitat types. Not only do they exert control on sea grass grazing, tiger sharks also influence and limit feeding of the fish community. Removal of the keystone species would lead to an imbalance in the food web by having over-exploitation of sea grass and fish by uncontrolled populations of turtles, dugongs, and dolphins.

### Starfish

#### **Starfish are the keystone species on the California coast**

Thompson 14 – John N., Professor, Department of Ecology and Evolutionary Biology, and Director, STEPS Institute for Innovation in Environmental Research, University of California, Santa Cruz, Author of Interaction and Coevolution and others, Encyclopedia Brittanica, is the largest international organization focused solely on ocean conservation, “keystone species,” 4/15, http://www.britannica.com/EBchecked/topic/315977/keystone-species

The starfish Pisaster ochraceus is a keystone species in the rocky marine intertidal communities off the northwest coast of North America. This predatory starfish feeds on the mussel Mytilus californianus and is responsible for maintaining much of the local diversity of species within certain communities. When the starfish have been removed experimentally, the mussel populations have expanded rapidly and covered the rocky intertidal shores so exclusively that other species cannot establish themselves. Consequently, the interaction between Pisaster and Mytilus supports the structure and species diversity of these communities. In other communities in which Pisaster occurs, however, the starfish has little overall effect on the structure of the community. Therefore, a species can be a keystone species in some communities but not in others.

## Hotspots

### Gulf of Mexico

#### The Gulf of Mexico is a marine biodiversity hotspot.

Miloslavich et al 10 – Patricia, Senior Professor at the Department of Environmental Studies, Universidad Simón Bolívar, “Marine Biodiversity in the Caribbean: Regional Estimates and Distribution Patterns,” 8/2, http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0011916

The Caribbean contains the greatest concentration of marine species in the Atlantic Ocean and is a global-scale hot spot of marine biodiversity [32]. Because the Caribbean is regarded as a distinct biogeographic province of the Tropical Western Atlantic Region, several authors (e.g., [29], [41]–[46]) have proposed more detailed biogeographic regionalizations within the Caribbean, using a variety of criteria for defining divisions. The growth of human population, particularly in coastal zones, and the environmental pressures imposed by economic growth and climate change pose great challenges to the future conservation of marine ecosystems and species diversity. In particular, the Caribbean Sea has large population densities, a long history of human use of marine resources, and remarkable land-based sources of pollution associated with oil production, port and tourism development, deforestation, and agriculture [45], [47]. The areal coverage of mangroves in the Caribbean has decreased by about 1% per year since 1980 [47]. Live coral cover has already declined by as much as 80% in many areas of Caribbean reefs over the last two decades because of various human activities and global warming [48], [49], and 35% of the region's fish stocks are overexploited [50], [51]. Despite a long history of scientific research in the region, our present knowledge about Caribbean marine biodiversity and species distribution does not satisfy the needs for objectively defining geographic conservation priorities and designing management plans at a regional scale. This is one of the reasons why conservation planners often make use of surrogates of species diversity (e.g., presence of habitats, bottom topography, wave exposure) to offset uncertainty and lack of detailed information (see [52], [53]), as has been the case in various recent attempts to determine the relative importance of sites for conservation in the Caribbean (e.g., [54]–[56]).

#### The Gulf of Mexico is of utmost importance

Brenner 14 – Jorge, postdoctoral research associate at the Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi, Sci Dev Net, "Guarding the Gulf of Mexico's valuable resources," 3/8, http://www.scidev.net/global/pollution/opinion/guarding-the-gulf-of-mexico-s-valuable-resources.html

The Gulf of Mexico is rich in biodiversity and unique habitats, and hosts the only known nesting beach of Kemp's Ridley, the world's most endangered sea turtle. The Gulf's circulation pattern gives it biological and socioeconomic importance: water from the Caribbean enters from the south through the Yucatan Channel between Cuba and Mexico and, after warming in the basin, leaves through the northern Florida Strait between the United States and Cuba to form the Gulf Stream in the North Atlantic that helps to regulate the climate of western Europe. About one-third of the Gulf is a broad continental shelf, which provides a wealth of fisheries. Intensive fishing is the biggest factor interfering with the Gulf's environment, and is an area where the three governments should cooperate in managing this international resource.

### Reefs

#### Various reefs are marine biodiversity hotspots and are very close to extinction.

Zubi 13 – Teresa, creator of Starfish Photo Collection, SPC, “1. ECOLOCY Major endangered reef regions,” 2/27, http://www.starfish.ch/reef/hotspots.html

Oceans cover 71 percent of earth's surface. Oceans have long been considered limitless places where human activities have little or no impact. But the coral reefs, the richest of the tropical marine habitats, are at risk of disappearing at an incredibly fast rate! Worldwide, already 25 percent of coral reefs have been destroyed or badly degraded. Some scientist reckon, that by 2020 up to 70 percent might be permanently lost. In 2002 researchers identified global priority areas for coral reef conservation and prepared a list with the world's top 10 coral reef hotspots. These are areas rich in marine species which are found only in small area. Therefore they are highly vulnerable to extinction. These 10 hotspots contain just 24 percent of the world's coral reefs, or 0.017 percent of the oceans, but claim 34 percent of restricted-range species. An interesting fast is, that 8 of the 10 coral reef hotspots are adjacent to a terrestrial hotspot. Those are regions of the world that harbor the highest concentrations of species on land and are also at the greatest risk. In addition to the correlation with terrestrial biodiversity hotspots, the paper notes that tropical reef ecosystems include "wilderness" areas, which remain far less impacted by people, are rich in species, and relative to degraded areas, still contain abundant populations of reef species that have already but disappeared from overexploited reefs. 1) Philippines The Philippines are ecologically unique in as far that there are a lot of small regions and areas (such as an island) that are highly diverse. Major threats are destructive fishing methods using explosives and poison (cyanid fishing for the aquarium trade), excessive fishing, pollution runoff from logging, agriculture and urban development. This is one of the most threatened hotspots, due to its population density. Hotspot Philippines - Descriptions and maps of dive sites in the Philippines (Zubi) 2) Sundaland The Sundaland hotspot encompasses some 1'600'000 km2 and covers the western half of the Indonesian archipelago (Bali, Java, Sumatra, Borneo), Malaysia and a small part of Thailand. It is part of the so called Coral Triangle which is probably the most diverse coastal area on the planet having a richness of marine species and a large occurrence of endemism. Major threats are pollution from land-based sources, intensive destructive fishing (dynamite) and a growing live reef fish trade (for the aquarium trade). Hotspot Sundaland - Descriptions and maps of dive sites in Indonesia (Zubi) 3) Wallacea The Wallacea hotspot encompasses some 346'782 km2 and covers Nusa Tenggara (Lombok, Sumbawa, Komodo, Flores, Sumba, Savu, Roti and Timor), the Mollucas and Sulawesi. Wallacea is divided from Sundaland by the Wallace's Line. Major threats are pollution from land-based sources, sediment pollution from logging, intensive destructive fishing (dynamite) and live reef fish trade (for the aquarium trade). Hotspot Wallacea - Descriptions and maps of dive sites in Nusa Tenggara (Zubi) 4) Gulf of Guinea This hotspot encompasses the four islands (Annobón, Bioco, São Tomé and Príncipe) of the Gulf of Guinea, off the West African coast. The exact area of reef is unknown, but is likely to be less than 200 km2. There are rivers nearby, so the water is not very salty. Major threats from coastal development, sediment pollution from logging, over-fishing and a proposed coral harvesting business. Link - Hotspot Gulf of Guinea 5) Southern Mascarene Islands This hotspot encompasses approximately 1'000 km2 of reef surrounding the islands of Mauritius, La Reunion and Rodriguez in the southern Indian Ocean. Major threats are the rapidly growing human population, pollution from intensive sugar cane production, coastal and agricultural development, and over-fishing. 6) Eastern South Africa This hotspot lies adjacent to Cape Floristic and encompasses less than 200 km2. Major threats are land-based sources of pollution, fishing and development of tourism. Hotspot Eastern South Africa 7) North Indian Ocean This hotspot encompasses the Maldives, Chagos islands and much of the Lakshadweep and Lakkadives archipelagoes, as well as Sri Lanka, a total of 10,000 km2. Global warming in 1998 increased the sea surface temperatures and resulted in severe coral bleaching. Global climate change continues to pose a threat, as do coral mining, over-fishing and ornamental fish collection. 8) Southern Japan, Taiwan and Southern China Over 3,000 km2 of reefs extending from Kyushu in Japan, through Taiwan to the coast of southern China. Major threats are shoreline development (proposed airport) and conversion for agriculture and aquaculture, rapidly growing human population and also global climate change, sea warming, and plagues of coral-eating Crown-of-Thorns starfish. Hotspot Japan 9) Cape Verde Islands Approximately 200 km2 in the mid-Atlantic off the West African coast. Major threats are coastal development, pollution from land clearing and agriculture, and over-fishing. Link 10) Western Caribbean This hotspot encompasses the Caribbean islands and coastal reefs from the Mexican Yucatan Peninsula to Colombia, more than 4'000 km2 of reefs. Major threats are epidemic diseases and coral bleaching resulting from global warming and coastal development for tourism. Hotspot Caribbean 11) The Red Sea and Gulf of Aden The Red Sea and Gulf of Aden hotspot extends for 2'500 km from north to south, including the Gulfs of Aqaba and Suez. Major threats are coastal and industrial developments, tourism and oil spills from tankers. The western and southern coast are less threatened.

#### Coral reefs are key to ocean ecosystems

**N**ational **M**arine **F**ishery **S**ervice, 20**00** (most recent date cites), <http://www.nmfs.noaa.gov/prot_res/PR/coralhome.html>

Coral reefs are the most complex, species-rich and productive marine ecosystems. Reefs cover 0.2% of the ocean’s area and yet they provide home to one-third of all marine fish species and tens of thousands of other species. Coral reefs provide essential fish habitat, support endangered and threatened species, and harbor protected marine mammals and turtles. Coral reef fisheries yield 6 million metric tons of fish catch annually, with one quarter of the total worldwide fish production in developing countries with coral reefs. On U.S. reefs, over 500 commercially valuable coral reef fishes and invertebrate are under federal management, including four candidate ESA species (Spurgeon 1992; NOAA 1996). Coral reefs provide critical protection to coastlines from storm damage, erosion and flooding by reducing wave action. Coral reefs are crucial sources of income and resources through their role in tourism, fisheries, building materials and as an important source of pharmaceutical compounds

### Philippines

#### **The Philippines have the largest area of a reef, making it a marine biodiversity hotspot.**

Pearce 2 – Fred, English author and journalist based in London, a science writer and has reported on the environment, popular science, NewScientist, “Top ten coral reef hotspots identified,” 2/14, http://www.newscientist.com/article/dn1927-top-ten-coral-reef-hotspots-identified.html#.U63wE41dVbt

As much as two-thirds of all the world's marine species live in just ten biodiversity "hotspots" covering less than a tenth of one per cent of the world's oceans, according to the first ever global assessment of our submerged biological heritage. The study, by Callum Roberts of the University of York, concentrated on tropical coral reefs. Often called the "rainforests of the oceans", coral reefs are home to most of the planet's marine species. He found the greatest density of threatened endemic species in the Philippines, Indonesia and - most surprising - around a handful of islands such as Sao Tome in the Gulf of Guinea off the coast of West Africa. Other key centres include the South China Sea, the Red Sea and the western Caribbean. "The Philippines has the largest area of reef, and is the most threatened," said Roberts. "Destructive fishing methods such as bombs and poisons have devastated many near-shore reefs." Other worldwide threats include pollution and climate change. Warmer waters kills coral. "The study identifies where biodiversity is bleeding away most rapidly," says Roberts. "Unless we take action right away, marine species will start going extinct." And that will impoverish people. "In the Philippines, some 70 per cent of animal protein comes from sea food."

#### The coral reefs of the Philippines are a marine biodiversity hotspot and are declining.

Alave 11 – Kristine L., contributing writer for the GMA News Network, a national television network in the Philippines, and also reports for the Philippine Daily, Philippine Daily Inquirer, “‘Hottest’ of biodiversity hot spots found in Philippines,” 5/31, http://globalnation.inquirer.net/2790/%E2%80%98hottest%E2%80%99-of-biodiversity-hot-spots-found-in-philippines

MANILA, Philippines—Years of unmitigated and destructive human activities have plunged the Philippines in a biodiversity “crisis” that could take decades to reverse, environment officials said Tuesday. Undersecretary Demetrio Ignacio of the Department of Environment and Natural Resources said the Philippines is one of the world’s most biodiverse places, but its marine and wildlife riches are under threat because of intrusive man-made activities. “The Philippines is one of the most threatened in the world. The rate of extinction of species is 1,000 times the natural rate because of manmade activities,” he told the Association of Southeast Asian Nations (Asean) Champions of Biodiversity awards. “It is a crisis. We are the hottest of the hot spots.” Rodrigo Fuentes, executive director of the Asean Center for Biodiversity, said the region where the Philippines is located is in danger of biodiversity loss. He described it as a “silent” crisis. “You don’t see it, but you feel it. We are in the midst of it.” “Habitat loss, unsustainable use of resources, climate change, invasive alien species and pollution have not been arrested and continue to negatively impact biodiversity,” Fuentes said in a statement. These threats contributed to the decline in the mangrove, coral reef, seagrass, forest, agro, peatland and freshwater ecosystems, he noted. Officials said it would be difficult to reverse the trend because it often takes years to get ecosystems back in balance. Moreover, people and governments only realize the loss of species and ecosystems when the crisis is there, making recovery harder and more expensive, Fuentes said. Ignacio said the Philippines’ main problem is the loss of habitats due to deforestation and coastal denigration. He cited as an example the recent discovery of black coral poaching in the seas of Mindanao, a part of the Coral Triangle where one of the world’s richest marine resources could be found. Coral reefs are considered to be “rainforests of the seas,” providing food, nutrients, and protection to many marine species. The loss of one species could have a domino effect on other creatures that depend directly and indirectly on it, the officials said. In the Philippines, deforestation is caused by unmitigated logging and urbanization. According to DENR, the Philippines has 8 million hectares of denuded and idle forest lands. A recent study by Conservation International said only about four percent of the Philippines’ forests remain as natural habitat for many endemic species. The CI also noted that forest lands are being cleared to make way for food production and other activities to meet the needs of the country’s rising population, now around 90 million. According to the DENR, the country loses about 2 percent of its forests every year. The Philippine government is seeking to reverse the trend by planting 1.5 billion trees in six years. Poor coastal management and unregulated fishing have contributed to the decline of water resources and coastal areas, the environmentalists said. The World Wide Fund for Nature recently said the Philippines used to have over 27,000 square kilometers of healthy coral reefs. However, 50 years of destructive commercial and unregulated fishing have left less than 5 percent in excellent condition, with just 1 percent in pristine state. Ignacio said the DENR could not quantify the country’s biodiversity loss, noting that there had been no assessment of it. “It takes a huge amount of resources,” he said. Protected Areas and Wildlife Bureau Director Theresa Mundita Lim said the destruction of Philippine coral reefs for the rare and valuable black corals appeared to be wider than initially reported. It could be five times the size of Manila, she said. Lim noted that it would take years for the reefs to recover their original health as corals are “slow growing” creatures. Black corals, for instance, grow only 2 millimeters a year. It could take “50-100 years” for the black corals to grow to their adult size, Lim said. The waters off Mindanao are not the only part of the country that are under threat from marine poachers. The entire Philippine coasts and seas are their harvest grounds, Lim said. Turtles, which are critically endangered, and sharks have been poached and sold illegally for their meat and fins in China and Taiwan where demand is high, she said. The Philippines has 36,289 kilometers of coastline and is considered to be the world’s second-largest archipelago. Environment officials said they do not have enough manpower and resources to guard the country’s coastline and seas.

# Impacts

### Oceans Impact Ext

#### Marine ecosystems are critical to the survival of all life on earth.

Craig 03 (Robin Kundis Craig, Associate Professor of Law, Indiana University School of Law, 34 McGeorge L. Rev. 155)

Biodiversity and ecosystem function arguments for conserving marine ecosystems also exist, just as they do for terrestrial ecosystems, but these arguments have thus far rarely been raised in political debates. For example, besides significant tourism values - the most economically valuable ecosystem service coral reefs provide, worldwide - coral reefs protect against storms and dampen other environmental fluctuations, services worth more than ten times the reefs' value for food production. n856 Waste treatment is another significant, non-extractive ecosystem function that intact coral reef ecosystems provide. n857 More generally, "ocean ecosystems play a major role in the global geochemical cycling of all the elements that represent the basic building blocks of living organisms, carbon, nitrogen, oxygen, phosphorus, and sulfur, as well as other less abundant but necessary elements." n858 In a very real and direct sense, therefore, human degradation of marine ecosystems impairs the planet's ability to support life. Maintaining biodiversity is often critical to maintaining the functions of marine ecosystems**.** Current evidence shows that, in general, an ecosystem's ability to keep functioning in the face of disturbance is strongly dependent on its biodiversity, "indicating that more diverse ecosystems are more stable." n859 Coral reef ecosystems are particularly dependent on their biodiversity. [\*265] Most ecologists agree that the complexity of interactions and degree of interrelatedness among component species is higher on coral reefs than in any other marine environment. This implies that the ecosystem functioning that produces the most highly valued components is also complex and that many otherwise insignificant species have strong effects on sustaining the rest of the reef system. n860 Thus, maintaining and restoring the biodiversity of marine ecosystems is critical to maintaining and restoring the ecosystem services that they provide. Non-use biodiversity values for marine ecosystems have been calculated in the wake of marine disasters, like the Exxon Valdez oil spill in Alaska. n861 Similar calculations could derive preservation values for marine wilderness. However, economic value, or economic value equivalents, should not be "the sole or even primary justification for conservation of ocean ecosystems. Ethical arguments also have considerable force and merit." n862 At the forefront of such arguments should be a recognition of how little we know about the sea - and about the actual effect of human activities on marine ecosystems. The United States has traditionally failed to protect marine ecosystems because it was difficult to detect anthropogenic harm to the oceans, but we now know that such harm is occurring - even though we are not completely sure about causation or about how to fix every problem. Ecosystems like the NWHI coral reef ecosystem should inspire lawmakers and policymakers to admit that most of the time we really do not know what we are doing to the sea and hence should be preserving marine wilderness whenever we can - especially when the United States has within its territory relatively pristine marine ecosystems that may be unique in the world. We may not know much about the sea, but we do know this much: if we kill the ocean we kill ourselves, and we will take most of the biosphere with us. The Black Sea is almost dead, n863 its once-complex and productive ecosystem almost entirely replaced by a monoculture of comb jellies, "starving out fish and dolphins, emptying fishermen's nets, and converting the web of life into brainless, wraith-like blobs of jelly." n864 More importantly, the Black Sea is not necessarily unique. The Black Sea is a microcosm of what is happening to the ocean systems at large. The stresses piled up: overfishing, oil spills, industrial discharges, nutrient pollution, wetlands destruction, the introduction of an alien species. The sea weakened, slowly at first, then collapsed with [\*266] shocking suddenness. The lessons of this tragedy should not be lost to the rest of us, because much of what happened here is being repeated all over the world. The ecological stresses imposed on the Black Sea were not unique to communism. Nor, sadly, was the failure of governments to respond to the emerging crisis. n865 Oxygen-starved "dead zones" appear with increasing frequency off the coasts of major cities and major rivers, forcing marine animals to flee and killing all that cannot. n866 Ethics as well as enlightened self-interest thus suggest that the United States should protect fully-functioning marine ecosystems wherever possible - even if a few fishers go out of business as a result.

#### Destruction of ocean environment will cause extinction

Sielen, 13 --- Senior Fellow for International Environmental Policy at the Center for Marine Biodiversity and Conservation at the Scripps Institution of Oceanography (Nov/Dec 2013, Alan B., Foreign Affairs, “The Devolution of the Seas: The Consequences of Oceanic Destruction,” <http://www.foreignaffairs.com/articles/140164/alan-b-sielen/the-devolution-of-the-seas>, JMP)

Of all the threats looming over the planet today, one of the most alarming is the seemingly inexorable descent of the world’s oceans into ecological perdition. Over the last several decades, human activities have so altered the basic chemistry of the seas that they are now experiencing evolution in reverse: a return to the barren primeval waters of hundreds of millions of years ago.

A visitor to the oceans at the dawn of time would have found an underwater world that was mostly lifeless. Eventually, around 3.5 billion years ago, basic organisms began to emerge from the primordial ooze. This microbial soup of algae and bacteria needed little oxygen to survive. Worms, jellyfish, and toxic fireweed ruled the deep. In time, these simple organisms began to evolve into higher life forms, resulting in the wondrously rich diversity of fish, corals, whales, and other sea life one associates with the oceans today.

Yet that sea life is now in peril. Over the last 50 years -- a mere blink in geologic time -- humanity has come perilously close to reversing the almost miraculous biological abundance of the deep. Pollution, overfishing, the destruction of habitats, and climate change are emptying the oceans and enabling the lowest forms of life to regain their dominance. The oceanographer Jeremy Jackson calls it “the rise of slime”: the transformation of once complex oceanic ecosystems featuring intricate food webs with large animals into simplistic systems dominated by microbes, jellyfish, and disease. In effect, humans are eliminating the lions and tigers of the seas to make room for the cockroaches and rats.

The prospect of vanishing whales, polar bears, bluefin tuna, sea turtles, and wild coasts should be worrying enough on its own. But the disruption of entire ecosystems threatens our very survival, since it is the healthy functioning of these diverse systems that sustains life on earth. Destruction on this level will cost humans dearly in terms of food, jobs, health, and quality of life. It also violates the unspoken promise passed from one generation to the next of a better future.

#### Protecting ocean ecosystems is key to save all life on earth

Sielen, 8 --- career senior executive at the EPA (Winter 2008, Alan B., The Fletcher Forum of World Affairs, “An Oceans Manifesto: The Present Global Crisis,” <http://cmbc.ucsd.edu/People/Faculty_and_Researchers/sielen/Sielen.pdf>, JMP)

A generation ago, French explorer and oceanographer Jacques Cousteau warned that the oceans were sick and getting worse every year. Embraced by the public for bringing people on every continent closer to the wonders of nature and for his unvarnished assessment of the state of the oceans, Cousteau was ridiculed by many government officials and scientists as an environmental alarmist. Fortunately, the oceans are not dead; in fact, some areas are teeming with life. Cousteau’s concerns, however, were prophetic: serious degradation of coastal and marine ecosystems worldwide continues, driven by global climate change, pollution, overfishing, and the destruction of coastal habitats. Once thought to possess an endless abundance of resources and an unlimited capacity to safely assimilate wastes, the oceans are now forcing us to reconsider many of our previous assumptions.

The oceans are indispensable in sustaining life on earth. They possess a rich diversity of marine life and support systems that affect the entire planet, such as climate, weather, fisheries, and biological productivity. The importance of the oceans cannot be separated from the larger global environment that encompasses the air, land, and freshwater. Nor will solutions to the problems facing them be distinct from broader questions concerning human development and the quality of life on earth.

Around the world, the daily existence of growing numbers of people is directly affected by the use and management of the oceans and their resources. The fishing industry is a source of protein for a large part of the world’s population and a livelihood, directly and indirectly, for hundreds of millions of people. Travel, tourism, and recreation in coastal areas have an even greater effect on national and global economies. Offshore areas account for as much as one third of the world’s energy supplies. Maritime transportation and port operations are of paramount importance for world trade. The many ways that the oceans can refresh and enrich the human spirit are as legendary as their awesome terrors, such as the devastating Indian Ocean earthquake and tsunami of December 26, 2004.

### Envt Impact Ext

#### Environmental degradation causes extinction

Coyne and Hoekstra 07, Jerry professor in the Department of Ecology and Evolution at the University of Chicago and Hopi Associate Professor in the Department of Organismic and Evolutionary Biology at Harvard University, New Republic, “The Greatest Dying,” 9/24, http://www.truthout.org/article/jerry-coyne-and-hopi-e-hoekstra-the-greatest-dying

But it isn't just the destruction of the rainforests that should trouble us. Healthy ecosystems the world over provide hidden services like waste disposal, nutrient cycling, soil formation, water purification, and oxygen production. Such services are best rendered by ecosystems that are diverse. Yet, through both intention and accident, humans have introduced exotic species that turn biodiversity into monoculture. Fast-growing zebra mussels, for example, have outcompeted more than 15 species of native mussels in North America's Great Lakes and have damaged harbors and water-treatment plants. Native prairies are becoming dominated by single species (often genetically homogenous) of corn or wheat. Thanks to these developments, soils will erode and become unproductive - which, along with temperature change, will diminish agricultural yields. Meanwhile, with increased pollution and runoff, as well as reduced forest cover, ecosystems will no longer be able to purify water; and a shortage of clean water spells disaster. In many ways, oceans are the most vulnerable areas of all. As overfishing eliminates major predators, while polluted and warming waters kill off phytoplankton, the intricateaquaticfoodweb could collapse from both sides. Fish, on which so many humans depend, will be a fond memory. As phytoplankton vanish, so does the ability of the oceans to absorb carbon dioxide and produce oxygen. (Half of the oxygen we breathe is made by phytoplankton, with the rest coming from land plants.) Species extinction is also imperiling coral reefs - a major problem since these reefs have far more than recreational value: They provide tremendous amounts of food for human populations and buffer coastlines against erosion. In fact, the global value of "hidden" services provided by ecosystems - those services, like waste disposal, that aren't bought and sold in the marketplace - has been estimated to be as much as $50 trillion per year, roughly equal to the gross domestic product of all countries combined. And that doesn't include tangible goods like fish and timber. Life as we know it would be impossible if ecosystems collapsed. Yet that is where we're heading if species extinction continues at its current pace. Extinction also has a huge impact on medicine. Who really cares if, say, a worm in the remote swamps of French Guiana goes extinct? Well, those who suffer from cardiovascular disease. The recent discovery of a rare South American leech has led to the isolation of a powerful enzyme that, unlike other anticoagulants, not only prevents blood from clotting but also dissolves existing clots. And it's not just this one species of worm: Its wriggly relatives have evolved other biomedically valuable proteins, including antistatin (a potential anticancer agent), decorsin and ornatin (platelet aggregation inhibitors), and hirudin (another anticoagulant). Plants, too, are pharmaceutical gold mines. The bark of trees, for example, has given us quinine (the first cure for malaria), taxol (a drug highly effective against ovarian and breast cancer), and aspirin. More than a quarter of the medicines on our pharmacy shelves were originally derived from plants. The sap of the Madagascar periwinkle contains more than 70 useful alkaloids, including vincristine, a powerful anticancer drug that saved the life of one of our friends. Of the roughly 250,000 plant species on Earth, fewer than 5 percent have been screened for pharmaceutical properties. Who knows what life-saving drugs remain to be discovered? Given current extinction rates, it's estimated that we're losing one valuable drug every two years. Our arguments so far have tacitly assumed that species are worth saving only in proportion to their economic value and their effects on our quality of life, an attitude that is strongly ingrained, especially in Americans. That is why conservationists always base their case on an economic calculus. But we biologists know in our hearts that there are deeper and equally compelling reasons to worry about the loss of biodiversity: namely, simple morality and intellectual values that transcend pecuniary interests. What, for example, gives us the right to destroy other creatures? And what could be more thrilling than looking around us, seeing that we are surrounded by our evolutionary cousins, and realizing that we all got here by the same simple process of natural selection? To biologists, and potentially everyone else, apprehending the genetic kinship and common origin of all species is a spiritual experience - not necessarily religious, but spiritual nonetheless, for it stirs the soul. But, whether or not one is moved by such concerns, it is certain that our future is bleak if we do nothing to stem this sixth extinction. We are creating a world in which exotic diseases flourish but natural medicinal cures are lost; a world in which carbon waste accumulates while food sources dwindle; a world of sweltering heat, failing crops, and impure water. In the end, wemust accept the possibility that we ourselves are not immune to extinction. Or, if we survive, perhaps only a few of us will remain, scratching out a grubby existence on a devastated planet. Global warming will seem like a secondary problem when humanity finally faces the consequences of what we have done to nature: not just another Great Dying, but perhaps the greatest dying of them all.

#### We have 6 years to stop biodiversity loss before humans face extinction

**Walsh 10** [Bryan, covers environment, energy and — when the need arises — particularly alarming diseases for TIME magazine, Wildlife: A Global Convention on Biodiversity Opens in Japan, But Can It Make a Difference? October 18, 2010 http://ecocentric.blogs.time.com/2010/10/18/wildlife-a-global-convention-on-biodiversity-opens-in-japan-but-can-it-make-a-difference/#ixzz131wU6CSp] (Merkley)

**All life on Earth exists thanks to the benefits from biodiversity** in the forms of fertile soil, clear water and clean air. ***We are now close to a 'tipping point'*** - that is, **we are about to reach a threshold beyond which biodiversity loss will become irreversible, and may cross that threshold i*n the next 10 years*** **if we do not make proactive efforts for conserving biodiversity**.  Ahmed Djoghlaf, the executive secretary of the CBD, struck an even darker note, reminding diplomats that they were on a clock—and time was running out:      Let's have the courage to look in the eyes of our children and admit that we have failed, individually and collectively, to fulfil the Johannesburg promise made by 110 heads of state to substantially reduce the rate of loss of biodiversity by 2010. **Let us look in the eyes of our children** and admit that **we continue to lose biodiversity at an unprecedented rate, thus mortgaging their future**.  But what will actually come out of the Nagoya summit, which will continue until Oct. 29? Most likely there will be another agreement—a new protocol—outlining various global strategies on sustaining biodiversity and goals on slowing the rate of species loss. (You can download a PDF of the discussion draft document that will be picked over at Nagoya.) It won't be hard for governments to agree on general ambitions for reducing biodiversity loss—who's against saving pandas?—but the negotiations will be much trickier on the question of who will actually pay for a more biodiverse planet? And much as we've seen in international climate change negotiations, the essential divide is between the developed and developing nations—and neither side seems ready to bend.  The reality is that much of the world's biodiversity—the most fantastic species and the most complete forests—is found in the poorer, less developed parts of the world. That's in part because the world's poor have been, well, too poor to develop the land around them in the way rich nations have. (There was once a beautiful, undeveloped island off the East Coast of the U.S., with wetlands and abundant forests. It was called Mannahatta. It's a little different now.) As a result, the rural poor—especially in tropical nations—are directly dependent on healthy wildlife and plants in a way that inhabitants of developed nations aren't. So on one hand that makes the poor directly vulnerable when species are lost and forests are chopped down—which often results in migration to thronging urban areas. But on the other, poverty often drives the rural poor to slash-and-burn forests for agriculture, or hunt endangered species to sell for bush meat. Conservation and development have to go hand in hand.  That hasn't always been the mantra of the conservation movement—as Rebecca Tuhus-Dubrow writes in Slate, conservation projects in the past sometimes displaced the human inhabitants over a reserve or park, privileging nature over people. But that's changed in recent decades—environmental groups like Conservation International or the Nature Conservancy now spend as much of their time working on development as they do in protecting nature. "Save the people, save the wildlife"—that's the new mantra.  The missing ingredient is money—and that's what will be up for debate at Nagoya. As climate change has risen on the international agenda, funding for biodiversity has lagged—the 33 member nations of the Organization for Economic Co-operation and Development (OECD) donated $8.5 billion for climate change mitigation projects in 2008, but just $3 billion annually for biodiversity. One way to change that could be through "payment for ecosystem services." A biodiverse landscape, intact forests, clean water and air—all of these ebbing qualities of a healthy world are vital for our economies as well. (The Economics of Ecosystems and Biodiversity, a UN-funded study, estimates that nature degradation costs the world $2 trillion to $5 trillion a year, with the poorest nations bearing the brunt of the loss.) Rich countries could pay more biodiverse developing nations to keep nature running—allowing poorer countries to capitalize on their natural resources without slashing and burning.  Will that work? I'm skeptical—the experience of climate change negotiations have shown that the nations of the world are great at high ideals and fuzzy goals, but not so hot at actually dividing up the pie in a more sustainable fashion. That doesn't mean there aren't smaller solutions—like Costa Rica's just-announced debt-for-nature deal—but a big bang from Japan this month doesn't seem too likely. The problem is as simple as it is unsolvable, at least so far—there's no clear path to national development so far that doesn't take from the natural world. That worked for rich nations, but **we're rapidly running out of planet**, as a report last week from the World Wildlife Fund showed. And there's something greater at stake as well, as the naturalist E.O. Wilson once put it:      The one process now going on that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats-this is the folly our descendants are least likely to forgive us.  **We're losing nature. And that loss really is forever.**

### Turns Disease

#### Overfished marine animals can serve as models for healthcare

Chivian 11, Director, Project on Global Environmental Change and Health; Physicians for Social Responsibility and AB, Harvard College; MD, Harvard Medical School, “Species Extinction, Biodiversity Loss and Human Health” http://www.ilo.org/oshenc/part-vii/environmental-health-hazards/item/505-species-extinction-biodiversity-loss-and-human-health

Like bears, many species of sharks are being decimated because of the demand for shark meat, especially in Asia, where shark fins for soup command prices as high as $l00 a pound (Stevens l992). Because sharks produce few offspring, grow slowly and take years to mature, they are highly vulnerable to overfishing. Sharks have been around for almost 400 million years and have evolved highly specialized organs and physiological functions that have protected them against virtually all threats, except slaughter by humans. The wiping out of populations and extinction of some of the 350 species may become a major disaster for human beings. The immune systems of sharks (and of their relatives, skates and rays) seem to have evolved so that the animals are almost invulnerable to developing cancers and infections. While tumours are often seen in other fish and molluscs (Tucker l985), they are rare in sharks. Preliminary investigations have supported this finding. It has proved impossible, for example, to produce tumour growth in Nurse Sharks with repeated injections of known potent carcinogenic substances (Stevens l992). And researchers at the Massachusetts Institute of Technology have isolated a substance, present in **large amounts, from Basking** Shark cartilage (Lee and Langer l983) that strongly inhibits the growth of new blood vessels towards solid tumours, and thereby prevents tumour growth. Sharks may also provide valuable models for developing new types of medications to treat infections, especially important at the present time when infectious agents are developing increasing resistance to currently available antibiotics.

#### Continued habitat destruction hinders efforts at healthcare breakthroughs

Chivian 11, Director, Project on Global Environmental Change and Health; Physicians for Social Responsibility and AB, Harvard College; MD, Harvard Medical School, “Species Extinction, Biodiversity Loss and Human Health” http://www.ilo.org/oshenc/part-vii/environmental-health-hazards/item/505-species-extinction-biodiversity-loss-and-human-health

Plant, animal and microbial species are themselves the sources for some of today’s most important medicines and make up a significant proportion of the total pharmacopoeia. Farnsworth (1990), for example, has found that 25% of all prescriptions dispensed from community pharmacies in the United States from l959 to l980 contained active ingredients extracted from higher plants. A much higher percentage is found in the developing world. As many as 80% of all people living in developing countries, or roughly two thirds of the world’s population, rely almost exclusively on traditional medicines using natural substances, mostly derived from plants. The knowledge held by traditional healers, often passed down orally over centuries, has led to the discovery of many medicines that are widely used today - quinine, physostigmine, d-tubocurarine, pilocarpine and ephedrine, to name a few (Farnsworth et al. l985). But that knowledge is fast disappearing, particularly in the Amazon, as native healers die out and are replaced by more modern medical practitioners. Botanists and pharmacologists are racing to learn these ancient practices, which, like the forest plants they employ, are also endangered (Farnsworth l990; Schultes l99l; Balick l990). Scientists have analysed the chemistry of less than 1% of known rainforest plants for biologically active substances (Gottlieb and Mors l980) - as well as a similar proportion of temperate plants (Schultes l992) *and even smaller percentages of known animals, fungi and microbes. But there may be tens of millions of species as yet undiscovered in the* forests, in soils, and in lakes and oceans. With the massive extinctions currently in progress, we may be destroying new cures for incurable cancers, for AIDS, for arteriosclerotic heart disease and for other illnesses that cause enormous human suffering.

### Turns Econ

#### Biodiversity Loss hurts the economy

Anon 11, “Biodiversity Loss spells Economic Crisis,” <http://knowledge.allianz.com/?1486/conservation-biodiversity-loss-economic-crisis-ecosystem>

We are living through the greatest mass extinction of life in about 65 million years. We lose three species an hour to urbanization, deforestation, overfishing, climate change, and invasive species, reckons the United Nations. It is shocking to think of a world without tigers or orang utans, but species loss is just the tip of the iceberg. ‘Biodiversity’ includes not just species but the genes that make species and the ecosystems that support them. Therefore biodiversity loss ranges from the eradication of ancient seed varieties to the destruction of coral reefs. What’s gone unnoticed until recently is how expensive biodiversity loss can be, between 2 and 4.5 trillion dollars in 2008, according to a landmark UN report The Economics of Ecosystems and Biodiversity (TEEB). That’s more than the 1.7 trillion dollars in economic costs that the Stern Review calculates will result from the same year’s planet-warming greenhouse gas emissions. In other words: biodiversity loss will hit the global economy harder than climate change. That’s because biodiversity provides us with vital ‘ecosystem services’ like fertile soil and freshwater. Forests, for example, provide flood prevention and drought control services, as well as nutrients and freshwater for farming, fuel wood for cooking, fodder for cattle, construction materials and foods. Over a billion of the world's poorest people depend on these services, which are generally available free. And therein lays the problem. “The economic invisibility of nature’s flows into the economy is a significant contributor to the degradation of ecosystems and the loss of biodiversity,” writes Pavan Sukhdev, leader of the UN's Economics of Ecosystems and Biodiversity initiative, in the foreword to TEEB. Markets simply don’t value nature’s bounty accordingly. The consequences can be catastrophic.

#### Sustainable marine environment is key to global economy

Sielen, 8 --- career senior executive at the EPA (Winter 2008, Alan B., The Fletcher Forum of World Affairs, “An Oceans Manifesto: The Present Global Crisis,” <http://cmbc.ucsd.edu/People/Faculty_and_Researchers/sielen/Sielen.pdf>, JMP)

As nations and citizens consider their interests in the oceans, it is important to cultivate a better understanding of the large-scale economic effects of coastal and marine ecosystems on regional, national, and local economies. The economic stakes in the oceans are especially high in much of the developing world, where fish and other marine resources play a large part in meeting basic human needs, including food and income. On a global scale, the world’s terrestrial and marine ecosystems provide at least $33 trillion annually in services. The benefits from ecosystems include food, water, timber, livelihoods, recreation, and cultural values, among many others—almost two thirds of which is contributed by marine systems. 7 The idea that a healthy and sustainable marine environment is an essential ingredient in the large economic engine of the world must be better understood and conveyed.

#### Oceans key to economy --- more important than the farm sector

Adams, 14 --- Oceans Advocate at National Resource Defense Council

(3/25/2014, Alexandra, “A Blue Budget Beyond Sequester: Taking care of our oceans,” <http://switchboard.nrdc.org/blogs/aadams/a_blue_budget_beyond_sequester.html>, JMP)

This past year was a tough year - from deep sequester cuts to a government shutdown. Our oceans definitely felt the budget crunch. After much excruciating negotiation, Congress finally passed a budget and now we are on the road to what we hope will be a saner way to govern and plan.

The President has just released his budget for Fiscal Year 2015. The National Oceanic and Atmospheric Administration (NOAA) budget can mean the difference between thriving oceans and coastal communities, or the decline in this invaluable public resource. This year’s budget signals that we will invest in protecting that resource, but by no means provides all that will be needed for the big job ahead. With half of Americans living in coastal areas, NOAA’s work means protecting our citizens and our natural resources. Moreover, with a national ocean economy that is larger than the entire U.S. farm sector in terms of jobs and economic output, keeping this economic powerhouse functioning matters to us all.

#### Biodiversity loss is costly for the economy

Anon 11, “Biodiversity Loss spells Economic Crisis,” <http://knowledge.allianz.com/?1486/conservation-biodiversity-loss-economic-crisis-ecosystem>

Soil erosion, accidentally introduced pests, and overfishing cost the global economy hundreds of billions of dollars every year. And if coral reefs were to disappear, 152 billion dollars of annual revenues would go with them. There are huge economic opportunities in biodiversity conservation. Dynamite fishing may net short-term profits but in the long run if you kill the coral reef the fish (and the tourists) will disappear. Meanwhile the certified organic food market, which protects biodiversity and ecosystem services, has mushroomed to over 40 billion dollars annually worldwide. The obvious answer to biodiversity loss is to properly value ecosystem services and species: to pay our debt to nature by paying people to protect it. The [REDD (Reducing Emissions from Deforestation and Forest Degradation)](http://knowledge.allianz.com/?1448) initiative would operate along these lines by paying forest nations not to cut down their trees. In the United States, investors can get banking credits for protecting wetlands and there are other new schemes for biodiversity credits in the pipeline. Now the challenge is to persuade businesses, politicians, and the public that nothing in nature comes for free.

### Turns Health

#### Ocean waste impacts human health

**Andrews 13,** “Plastics in the Ocean Affecting Human Health,” http://serc.carleton.edu/NAGTWorkshops/health/case\_studies/plastics.html

Different plastics spread throughout the ocean. As Styrofoam breaks into smaller parts, polystyrene components in it sink lower in the ocean, so that the pollutant spreads throughout the sea column. In fact, not only do the toxins in plastic effect the ocean, but acting like sponges, they soak up other toxins from outside sources before entering the ocean. As these chemicals are ingested by animals in the ocean, this is not good for humans. We as humans ingest contaminated fish and mammals. For more information on this topic on toxins in the ocean, see this article by National Geographic. National Geographic There are different types of ways that plastic is dangerous for humans. Direct toxicity from plastics comes from lead, cadmium, and mercury. These toxins have also been found in many fish in the ocean, which is very dangerous for humans. Diethylhexyl phthalate (DEHP) contained in some plastics, is a toxic carcinogen. Other toxins in plastics are directly linked to cancers, birth defects, immune system problems, and childhood developmental issues.

### Arctic BioD Impact

#### Arctic ecosystems key to human survival

CAFF 98– Biodiversity Working group of the Arctic Council, Conservation of Arctic Flora and Fauna, September 1998, “Strategic Plan for the Conservation of Arctic Biological Diversity” http://arcticportal.org/uploads/RX/zN/RXzNc4KU8QKfhN\_KDw\_oQQ/The-StrategicPlanforTheConservofArcticBiolDiv.pdf

The **species of the Arctic are important** for their own sake and for their value, directly or indirectly, **to other parts of their ecosystems,** including humans(SIC). Of particular concern for conservation are **rare and endangered species**. CAFF’s inventories have identified 39 species and subspecies of rare and endangered birds and mammals and 96 species of rare endemic vascular plants (i.e., those with root systems) in the Arctic. In addition, several shared species, such as murres (guillemots) and eiders, have been targeted for co-operative action as species of common conservation concern. While these species may not be considered rare or endangered at a global level, **some populations may be seriously threatened at the local level in parts of the Arctic**. Out of the approximately 360 bird species that breed regularly in the Arctic region as defined by CAFF, 279 migrate out of the region and spend the winter in a non-Arctic country. In addition, **many Arctic plant species**are also found elsewhere, which may affect **their** overall genetic diversity**.** The conservation of these species may require co-operative efforts with non-Arctic countries

### Ocean Acidification Impact

#### Changes in the Ocean create insecurity

Werrell 12, “Fragile States Add Climate Change and Ocean Acidification to List of Woes,” <http://climateandsecurity.org/2012/09/25/fragile-states-add-climate-change-and-ocean-acidification-to-list-of-woes/>

A [new report](http://oceana.org/sites/default/files/reports/Ocean-Based_Food_Security_Threatened_in_a_High_CO2_World.pdf) by Oceana shows just how connected our oceans are to human well-being, and how even small changes in the ocean’s pH levels, coupled with climate change, can have profound consequences for security. According to the report, by the middle of this century climate change and ocean acidification may dramatically heighten food insecurity among nations and territories that are heavily dependent on the oceans for sustenance. The report gauges a country’s likely “vulnerability to food security threats from climate change and ocean acidification” by assessing the exposure of its fisheries to climate change and ocean acidification, its dependence on fisheries as a source of sustenance for its population, and its adaptive capacity. The interesting, and worrying, element of this report is that many of the nations and territories that seem most vulnerable to climate change and ocean acidification also happen to be some of the world’s most fragile places. For example, Pakistan, Sudan and Haiti’s food security profiles are ranked by Oceana as highly vulnerable to the effects of climate change and ocean acidification, and these countries also rank as some of the world’s most fragile states in the Fund for Peace’s “[Failed State Index 2012](http://www.fundforpeace.org/global/?q=fsi-grid2012).” This is a clear example of how climate change and ocean acidification can act as “[threat multipliers,](http://www.cna.org/sites/default/files/news/FlipBooks/Climate%20Change%20web/flipviewerxpress.html)” exacerbating already fragile economic, social and political environments. However, while indices that rank countries are good for press and baseline comparisons, they are often, due to project limitations and goals, limited in scope. With this in mind, it is important to also consider the regional impact of individual states’ vulnerabilities, and how food insecurity in one state can impact neighboring states – or even distant states, as part of a phenomenon Dr. Troy Sternberg calls “[the globalization of hazards](http://www.nature.com/nature/journal/v472/n7342/full/472169d.html).” For example, several countries on Oceana’s vulnerability list, such as China and the Philippines, border the South China Sea. These countries vary in vulnerability, but share significant tensions over the navigation of the waters (fishing boats included) and access to other resources of the sea. In this instance, climate change and ocean acidification, which can [impact fish migrations](http://climateandsecurity.org/2012/01/09/new-report-the-united-states-the-south-china-sea-natural-resources-and-climate-change/) and lead to further disputes, are additional stresses on an already volatile situation. Another important example of climate change and ocean acidification acting as a stress multiplier is in countries that are already facing shortages of freshwater for irrigating crops. Many of these countries, such as [Libya](http://www.fao.org/docrep/015/i2497e/i2497e00.pdf), [Sudan](http://www.unsudanig.org/sudan/data/about/Economy.pdf), and [Eritrea](http://www.fao.org/fileadmin/templates/est/PUBLICATIONS/Books/AFRICA_STUDY_BOOK_REVISED_low_res.pdf) are heavily dependent on food imports. A decrease in food obtained from the oceans means these countries will likely have to import more crops, potentially increasing their vulnerability to shifts in global food markets, and crop failures in parts of the world [sometimes thousands of miles away](http://climateandsecurity.org/2012/07/17/when-national-disasters-go-global-drought-in-the-u-s-food-and-global-insecurity/). Indeed, if a country like China cannot rely on secure fisheries because of climate change and ocean acidification (Oceana ranks China 35th in vulnerability), and cannot depend on a reliable wheat harvest due to increased drought days, it may be [forced to purchase more wheat on the global market](http://www.nytimes.com/2011/02/14/world/asia/14china.html) to feed its billions of citizens, creating major shortages elsewhere, driving up global wheat prices, and facilitating hunger and potential unrest. Despite the limitations of country rankings, they can be very instructive. Climate change and ocean acidification are two non-trivial factors in the fragility of states and regions, and should be taken into account in future iterations of ‘failed state,’ ‘vulnerability’ and ‘food security’ indices, as well as security assessments in general. Such seemingly small variables can turn out to make a huge difference.

# Aff Answers

## AFF—Nonunique

### BioD Low (General)

#### Human activities hurt Wildlife

Chivian 11, Director, Project on Global Environmental Change and Health; Physicians for Social Responsibility and AB, Harvard College; MD, Harvard Medical School, “Species Extinction, Biodiversity Loss and Human Health” http://www.ilo.org/oshenc/part-vii/environmental-health-hazards/item/505-species-extinction-biodiversity-loss-and-human-health

Human activity is causing the extinction of animal, plant and microbial species at rates that are a thousand times greater than those which would have occurred naturally (Wilson l992), approximating the largest extinctions in geological history. When homo sapiens evolved, some l00 thousand years ago, the number of species that existed was the largest ever to inhabit the Earth (Wilson l989). Current rates of species loss are reducing these levels to the lowest since the end of the Age of Dinosaurs, 65 million years ago, with estimates that one-fourth of all species will become extinct in the next 50 years (Ehrlich and Wilson l99l). In addition to the ethical issues involved - that we have no right to kill off countless other organisms, many of which came into being tens of millions of years prior to our arrival - this behaviour is ultimately self-destructive, upsetting the delicate ecological balance on which all life depends, including our own, and destroying the biological diversity that makes soils fertile, creates the air we breathe and provides food and other life-sustaining natural products, most of which remain to be discovered. The exponential growth in human population coupled with an even greater rise in the consumption of resources and in the production of wastes, are the main factors endangering the survival of other species. Global warming, acid rain, the depletion of stratospheric ozone and the discharge of toxic chemicals into the air, soil and fresh- and salt-water ecosystems - all these ultimately lead to a loss of biodiversity. But it is habitat destruction by human activities, particularly deforestation, that is the greatest destroyer

### Ocean BioD Low: Coral Reefs

#### Increased activity causes marine extinction- coral reefs are at risk now

**Peace 09, “**Increasing Ocean Acidification Is Tipping Fragile Balances within Marine Ecosystems,” <http://insideclimatenews.org/news/20091201/increasing-ocean-acidification-tipping-fragile-balances-within-marine-ecosystems> Falling pH levels are particularly harmful for calcifying organisms such as coral and shellfish, which have a harder time building and maintaining their calcium-based exteriors as the ocean grows more acidic. A recent study of the changes in shellfish at different levels of ocean acidity found that the concentrations of CO2 likely to be found in oceans later this century decreased the chances of survival for young clams and scallops by more than 50%. The survivors also developed more slowly, suggesting their populations would be even more vulnerable to prey. Since acidification happens at a rate parallel to the increase of atmospheric carbon dioxide — oceans absorb about one-third of CO2 — it’s picking up pace. According to CBD oceans director Miyoko Sakashita, coral reefs are likely to be the first major ecosystems widely damaged by the effects of more acidic oceans. “Within a few decades, global warming and ocean acidification threaten to completely unravel magnificent coral reefs that took millions of years to build,” Sakashita said. In fact, some ocean researchers fear that acidification will obliterate Earth’s coral reefs in as few as 50 years. That’s why they have begun to design cryogenically cooled coral preservation “arks” where polyps can be stored to stave off total extinction. London Institute of Zoology researcher Alex Rogers explained: “At the moment the concept we are actually looking at is to literally have a frozen ark for reef-building corals. So that essentially is a lab-based project to freeze the diversity of corals that can build coral reefs.” Rogers and his team hope to have coral arks operating within two years at the UK’s Whipsnade Zoo and, eventually, at other locations worldwide. After collecting and freezing small samples of diverse coral species from the ocean, the scientists plan to construct propagation centers where new colonies and entire reefs can be re-built using the preserved coral tissue

### Ocean BioD Low: Pollution

#### Increased chemical activity will harm the life of all on Earth

\*\*NOTE—this can also be an impact card- the problem is that it says that the stuff is happening now

Chivian 11, Director, Project on Global Environmental Change and Health; Physicians for Social Responsibility and AB, Harvard College; MD, Harvard Medical School, “Species Extinction, Biodiversity Loss and Human Health” http://www.ilo.org/oshenc/part-vii/environmental-health-hazards/item/505-species-extinction-biodiversity-loss-and-human-health

Scientists do not know the answers to these and other critically important questions. But there are worrisome biological signals which suggest that major damage to global ecosystems has already occurred. The rapid simultaneous drop in populations of many species of frogs worldwide, even in pristine environments far from people, indicates that they may be dying as a consequence of some global environmental change (Blakeslee l990). Recent studies (Blaustein 1994) suggest that increased ultraviolet-B radiation from thinning of the ozone layer may be the cause in some of these cases. Closer to humans, marine mammals such as striped dolphins in the Mediterranean, European harbour seals off the coast of Scandinavia and of northern Ireland, and Beluga whales in the Saint Lawrence River are also dying in record numbers. In the case of the dolphins and the seals, some of the deaths seem to be due to infections by morbilli viruses (the family of viruses including measles and canine distemper virus) causing pneumonias and encephalitides (Domingo and Ferrer l990; Kennedy and Smyth l988), perhaps also the consequence of compromised immune systems. In the case of the whales, chemical pollutants such as DDT, the insecticide Mirex, PCBs, lead and mercury seem to be involved, suppressing the Belugas’ fertility and causing their deaths ultimately by a variety of tumours and pneumonias (Dold l992). The Beluga carcasses were often so filled with these pollutants that they could be classified as hazardous waste. Are these “indicator species”, like canaries that die in coal mines containing poisonous gases, warning us that we are upsetting fragile ecosystem balances that support all life, including our own? The 50% drop in sperm counts in healthy men worldwide during the period l938-l990 (Carlsen et al. l992), the marked increases in the rate of congenital malformations of the external genitalia in males in England and Wales from l964 to l983 (Matlai and Beral l985), the dramatic rise in some cancer incidence rates for white children from l973 to l988 (Angier l99l) and for white adults from l973 to l987 (Davis, Dinse and Hoel l994) in the United States, and the steady growth in the mortality rates for several cancers worldwide for the last three to four decades (Kurihara, Aoki and Tominaga l984; Davis and Hoel l990a, 1990b; Hoel l992) all suggest that environmental degradation may be starting to compromise not only the survival of frogs, marine mammals and other animal, plant and microbial species, but that of the human species as well.

#### Development in the ocean harms the marine ecosystem

McAvoy 14, This author is also published by Google News, MSNBC, USA Today, The Huffington Post, Kansas City Star, and 12 more sources“In Hawaii, Saltwater Fish Are At The Center Of A Battle Over Conservation,” http://www.huffingtonpost.com/2014/06/26/hawaii-saltwater-aquariums-conservation-battle\_n\_5532141.html?utm\_hp\_ref=green

The group is focusing on filming and documenting to bring attention to what he called "a very fragile ecosystem out there that is being depleted for the sole benefit of a multi-billion dollar industry for the home and business hobbyist." Fish collectors say the filming isn't harmless, saying it could scare away skittish fish. West Hawaii's aquarium fish collecting rules date to the late 1990s, when the state Legislature, responding to concerns about declining fish stocks, banned fish collecting along sections of the coastline. Today, collecting is prohibited on 35 percent of the coast. Scientific surveys show yellow tang populations have jumped 88 percent in these areas since the regulations went into effect, said Brian Tissot, a Humbolt State University conservation biologist who has studied the fishery for decades. Numbers of goldring surgeonfish, the second most-caught aquarium fish, climbed 37 percent. The population growth has spilled over into areas where fish collecting is allowed. A local fisheries advisory council — made up of environmentalists, divers, fish collectors, tourism industry officials and others — recently moved to strengthen the regulations. Their new rules limit species that collectors may capture to a list of 40. Arielle Levine, a San Diego State University marine conservation expert who recently co-authored a paper on the success of the no-collection zones, said they're doing "an impressive job" of protecting and increasing fish populations. Other factors harming the area's coral reefs haven't been as well managed, she said. Reefs are being smothered when sediment and nutrients like fertilizer wash into the ocean from coastal housing and hotel developments. Algae-eating fish that would prevent excessive plant growth from choking the reefs are heavily fished for food. Andy Rhyne, an assistant professor at Roger Williams University and New England Aquarium research scientist, said the fishery's management could still be improved but regulations have "really worked." "This is not a debate or data or science. It's an emotional argument," Rhyne said.

### Ocean BioD Low: Warming

#### Climate Change is the biggest threat to Marine ecosystems

National Geographic no date, “Marine Habitat Destruction,” http://ocean.nationalgeographic.com/ocean/critical-issues-marine-habitat-destruction/

Perhaps the most devastating of all habitat-altering agents, however, is climate change. Scientists are still coming to grips with the consequences that excessive atmospheric carbon dioxide and Earth's rapid warming are having on ecosystems. But there is ample evidence indicating that the oceans are bearing the brunt of these changes. As Earth's temperature rises, it is primarily the oceans that absorb the extra heat. Even small temperature changes can have far-reaching effects on the life cycles of marine animals from corals to whales. In addition, warmer temperatures cause excess melting of ice caps and glaciers, raising sea levels and flooding estuaries. High levels of atmospheric carbon dioxide, caused mainly by the burning of fossil fuels, are absorbed by the oceans, where the gas dissolves into carbonic acid. This elevated acidity inhibits the ability of marine animals, including many plankton organisms, to create shells, disrupting life within the very foundation of the ocean's food web.

#### Oceans are most effected by Warming

National Geographic no date, “Sea Temperature Rise,” http://ocean.nationalgeographic.com/ocean/critical-issues-sea-temperature-rise/

As climate change has warmed the Earth, oceans have responded more slowly than land environments. But scientific research is finding that marine ecosystems can be far more sensitive to even the most modest temperature change. Global warming caused by human activities that emit heat-trapping carbon dioxide has raised the average global temperature by about 1°F (0.6°C) over the past century. In the oceans, this change has only been about 0.18°F (0.1°C). This warming has occurred from the surface to a depth of about 2,300 feet (700 meters), where most marine life thrives. Perhaps the ocean organism most vulnerable to temperature change is coral. There is evidence that reefs will bleach (eject their symbiotic algae) at even a slight persistent temperature rise. Bleaching slows coral growth, makes them susceptible to disease, and can lead to large-scale reef die-off. Other organisms affected by temperature change include krill, an extremely important link at the base of the food chain. Research has shown that krill reproduce in significantly smaller numbers when ocean temperatures rise. This can have a cascading effect by disrupting the life cycle of krill eaters, such as penguins and seals—which in turn causes food shortages for higher predators.

#### Have to get rid of fossil fuels to solve

National Geographic no date, “Ocean Acidification,” http://ocean.nationalgeographic.com/ocean/critical-issues-ocean-acidification/

The oceans currently absorb about a third of human-created CO2 emissions, roughly 22 million tons a day. Projections based on these numbers show that by the end of this century, continued emissions could reduce ocean pH by another 0.5 units. Shell-forming animals including corals, oysters, shrimp, lobster, many planktonic organisms, and even some fish species could be gravely affected. Equally worrisome is the fact that as the oceans continue to absorb more CO2, their capacity as a carbon storehouse could diminish. That means more of the carbon dioxide we emit will remain in the atmosphere, further aggravating global climate change. Scientific awareness of ocean acidification is relatively recent, and researchers are just beginning to study its effects on marine ecosystems. But all signs indicate that unless humans are able to control and eventually eliminate our fossil fuel emissions, ocean organisms will find themselves under increasing pressure to adapt to their habitat's changing chemistry or perish.

## AFF—No Link

### No Link – OTEC

#### OTEC can power the world twice over, and still not negatively affect the ocean’s environment

OTEC news 13

<http://www.otecnews.org/what-is-otec/> Otecnews.org brings the latest news, project developments, and events around Ocean Thermal Energy Conversion (OTEC) and related subjects, such as ocean engineering, mariculture, power infrastructure, environmental impact and global climate change. The purpose of the OTEC foundation with the OTEC news website is to centralize and organize the current scattered information on OTEC, educate the public and raise global awareness by providing factual OTEC information and news, and to make sure that OTEC development is accelerated by bringing all the different parties together. Building a support base among politicians, government administrators, media pundits and industry experts is crucial for OTEC to cross the gap to full commercial deployment. (Merkley)

The oceans cover more than 70% of Earth’s surface and capture a large part of the sun’s heat in the upper layers, making them the world’s largest solar collectors and energy storage system. Utilizing just a small portion of this energy, can cover the global energy need. The energy source of OTEC is free, available abundantly and is continually being replenished as long as the sun shines and the natural ocean currents exist. Various renowned parties estimate the amount of energy that can be practically harvested to be [in the order of 3 to 5 terawatts](http://www.otecnews.org/2012/10/how-much-ocean-thermal-energy-can-be-converted-to-electricity/) (1 terawatt is 1012 watts) of baseload power generation, without affecting the temperature of the ocean or the world’s environment. That’s about twice the global electricity demand. The oceans are thus a vast renewable resource, with the potential to contribute to the future energy mix offering a sustainable electricity production method.

### No Link – Wind turbines

#### Wind Farms increase marine life

Mann and Teilmann 13

“Environmental impact of wind energy” J Mann1 and J Teilmann2 28 May 2013 <http://iopscience.iop.org/1748-9326/8/3/035001/pdf/1748-9326_8_3_035001.pdf> Department of Wind Energy, Technical University of Denmark (Merkley)

Both studies did observations both before and after the installation of the turbines using acoustic data loggers placed on the sea bottom inside and outside the wind farm. Scheidat et al ( [201](#page4)1) found a significant increase of 160% in the presence of porpoises 1–2 years after the wind farm was in normal operation, compared to the baseline period (the construction period was not studied). It was suggested that this could be caused by less ship traffic and more food due to the ban of fishery inside the wind farm.

### A2 Wind turbines kill birds

#### The amount of birds killed by windturbines is extremely insignificant and fossil fuel plants kill 35 times more birds. Also- Bird death by wind turbine is decreasing.

Shahan 13

November 26th, 2013 by [Zachary Shahan](http://cleantechnica.com/author/zshahan/) Wind Farm Bird Deaths vs Fossil Fuel & Nuclear Power Bird Deaths <http://cleantechnica.com/2013/11/26/wind-farm-bird-deaths-fossil-fuel-nuclear-bird-deaths/> Zachary Shahan is the director of [CleanTechnica](http://cleantechnica.com/), the most popular cleantech-focused website in the world, and [Planetsave](http://planetsave.com/), a world-leading green and science news site. He has been covering green news of various sorts since 2008, and he has been especially focused on solar energy, electric vehicles, and wind energy since 2009. Aside from his work on CleanTechnica and Planetsave, he's the founder and director of [Solar Love](http://solarlove.org/), [EV Obsession](http://evobsession.com/), and [Bikocity](http://bikocity.com/). To connect with Zach on some of your favorite social networks, go to [ZacharyShahan.com](http://zacharyshahan.com/) and click on the relevant buttons. (Merkley)

Wind farms kill roughly 0.27 birds per GWh. Nuclear plants kill about 0.6 birds per GWh. (2.2x wind) Fossil-fueled power stations kill about 9.4 birds per GWh. (34.8x wind) OK, so now we know that wind farms are not one of our birds’ biggest problems. And we know that closing nuclear and coal plants and replacing them with wind farms would be better for the birds. Should we stop there? No, we can make wind farms even safer for birds. In 2009, there were 12.5 bird kills per MW of installed wind capacity. In 2012, there were 9.5 bird kills per MW of installed wind capacity. That’s a 24% decrease. A very major improvement in bird safety. And we aren’t done yet.

## AFF—No Impact

### Envt Resilient

#### Environment Resilient - BP Gulf Proves

Waters 12, web producer, editor and writer for the Ocean Portal at the Smithsonian National Museum of Natural History. She received Biology and Latin degrees from Minnesota’s Carleton College, “The Oil Spill, Two Years Later,” http://ocean.si.edu/blog/oil-spill-two-years-later

Two years ago last week, on April 20, 2010, an explosion on the oil-drilling rig Deepwater Horizon caused the largest marine oil spill in history, gushing nearly 5 million barrels of crude oil over the course of three months. And, since then, researchers have been hard at work to understand how the oil spill impacted life in the Gulf of Mexico. It’s too soon to say whether the ecosystem is out of the red – it’s only been two years, after all! – but many researchers have been shocked at the ecosystem’s recovery. “Like everybody else, I had visions of just gobs and gobs of oil smothering thousands of acres of salt marsh,” says James Morris, who studies marshland plants at the University of South Carolina. “But that didn’t really happen.” As you can see in this slideshow, the marsh grasses are growing back despite being killed off two years ago by the oil. “The plants out there are really tough as nails,” says Morris. “Animals will probably be more susceptible than the plants are, but plants, after all, are the foundation of the ecosystem. If the plants are there, the animals will come back.” While the Gulf is not oil-free, far less of the oil stuck around than scientists expected – thanks, in part, to oil-eating microbes. Because there are many natural oil seeps on the Gulf’s seafloor, these microbes already called the Gulf home and were more than happy to feed on the new source of food introduced by the spill. The water in the Gulf is also very warm – especially compared to Alaskan waters, where the last major US oil spill occurred in 1989 – boosting the microbes’ metabolisms and enabling them to gobble up the oil faster. These are good signs for the ecosystems as a whole, but it doesn’t mean everything is coming up roses. Scientists still have much to learn: how long the oil will stay in the food chain; whether the coral communities will rebound; whether dolphins and other marine mammals will return; whether the fisheries – including the endangered Bluefin tuna -- will recover. And it’s going to take more years of research to tease apart what changes are the results of the spill or dispersant chemicals used to clean up the spill, and which are just normal variations in the ecosystem. For example, soon after the oil spill, researchers noticed that the number of small fish in the Gulf had decreased pretty dramatically. At first they were worried: had the oil destroyed their nursing grounds? But it’s also possible that the fishing ban, which went into effect soon after the spill, allowed predatory fish to rule the waters – snacking on every small fish in sight. It could be the nursing grounds, the fishing ban, some combination of the two, or other unknown factors. Only one thing is certain: that scientists need more time to fully understand the impacts of the oil spill. “There’s still a lot we don’t know about how this spill altered the food web of the Gulf of Mexico ecosystem,” says Samantha Joye, who studies marine chemistry and microbes at the University of Georgia. “We’re trying to understand very complicated interactions and feedbacks in a dynamic, constantly-changing system, and it’s going to take time.”

### Oceans Resilient

#### Marine ecosystems are resilient — no system collapse

Kennedy 2 — Victor Kennedy, PhD Environmental Science and Dir. Cooperative Oxford Lab (“Coastal and Marine Ecosystems and Global Climate Change,” Pew Center on Global Climate Change, Available Online: <http://www.c2es.org/docUploads/marine_ecosystems.pdf>, Accessed: 09/02/2013)

There is evidence that marine organisms and ecosystems are resilient to environmental change. Steele (1991) hypothesized that the biological components of marine systems are tightly coupled to physical factors, allowing them to respond quickly to rapid environmental change and thus rendering them ecologically adaptable. Some species also have wide genetic variability throughout their range, which may allow for adaptation to climate change.

#### No impact --- humans and the environment are adaptable

Doremus, 2000 – Professor of Law at UC Davis

(Holly, Washington & Lee Law Review, “The Rhetoric and Reality of Nature Protection: Toward a New Discourse,” Winter 2000, 57 Wash & Lee L. Rev. 11, JMP)

In recent years, this discourse frequently has taken the form of the ecological horror story. That too is no mystery. The ecological horror story is unquestionably an attention-getter, especially in the hands of skilled writers [\*46] like Carson and the Ehrlichs. The image of the airplane earth, its wings wobbling as rivet after rivet is carelessly popped out, is difficult to ignore. The apocalyptic depiction of an impending crisis of potentially dire proportions is designed to spur the political community to quick action. Furthermore, this story suggests a goal that appeals to many nature lovers: that virtually everything must be protected. To reinforce this suggestion, tellers of the ecological horror story often imply that the relative importance of various rivets to the ecological plane cannot be determined. They offer reams of data and dozens of anecdotes demonstrating the unexpected value of apparently useless parts of nature. The moth that saved Australia from prickly pear invasion, the scrubby Pacific yew, and the downright unattractive leech are among the uncharismatic flora and fauna who star in these anecdotes. n211 The moral is obvious: because we cannot be sure which rivets are holding the plane together, saving them all is the only sensible course.

Notwithstanding its attractions, the material discourse in general, and the ecological horror story in particular, are not likely to generate policies that will satisfy nature lovers. The ecological horror story implies that there is no reason to protect nature until catastrophe looms. The Ehrlichs' rivet-popper account, for example, presents species simply as the (fungible) hardware holding together the ecosystem. If we could be reasonably certain that a particular rivet was not needed to prevent a crash, the rivet-popper story suggests that we would lose very little by pulling it out. Many environmentalists, though, would disagree. n212

Reluctant to concede such losses, tellers of the ecological horror story highlight how close a catastrophe might be, and how little we know about what actions might trigger one. But the apocalyptic vision is less credible today than it seemed in the 1970s. Although it is clear that the earth is experiencing a mass wave of extinctions, n213 the complete elimination of life on earth seems unlikely.n214 Life is remarkably robust. Nor is human extinction probable any time soon. Homo sapiens is adaptable to nearly any environment. Even if the world of the future includes far fewer species, it likely will hold people. n215

One response to this credibility problem tones the story down a bit, arguing not that humans will go extinct but that ecological disruption will bring economies, and consequently civilizations, to their knees. n216 But this too may be overstating the case. Most ecosystem functions are performed by multiple species. This functional redundancy means that a high proportion of species can be lost without precipitating a collapse. n217

#### No impact to biodiversity

Sagoff 97  Mark, Senior Research Scholar – Institute for Philosophy and Public policy in School of Public Affairs – U. Maryland, William and Mary Law Review, “INSTITUTE OF BILL OF RIGHTS LAW SYMPOSIUM DEFINING TAKINGS: PRIVATE PROPERTY AND THE FUTURE OF GOVERNMENT REGULATION: MUDDLE OR MUDDLE THROUGH? TAKINGS JURISPRUDENCE MEETS THE ENDANGERED SPECIES ACT”, 38 Wm and Mary L. Rev. 825, March, L/N

Note – Colin Tudge - Research Fellow at the Centre for Philosophy at the London School of Economics. Frmr Zoological Society of London: Scientific Fellow and tons of other positions. PhD. Read zoology at Cambridge.

Simon Levin = Moffet Professor of Biology, Princeton. 2007 American Institute of Biological Sciences Distinguished Scientist Award 2008 Istituto Veneto di Scienze Lettere ed Arti 2009 Honorary Doctorate of Science, Michigan State University 2010 Eminent Ecologist Award, Ecological Society of America 2010 Margalef Prize in Ecology, etc… PhD

Although one may agree with ecologists such as Ehrlich and Raven that the earth stands on **the brink of** an episode of **massive extinction, it may not follow** from this grim fact **that human** being**s will suffer** as a result. On the contrary, skeptics such as science writer Colin Tudge have challenged biologists to explain **why we need more than a tenth of the 10 to 100 million species that grace the earth**. Noting that "cultivated systems often out-produce wild systems by 100-fold or more," Tudge declared that "the argument that humans need the variety of other species is, when you think about it, a theological one." n343 Tudge observed that "the elimination of all but a tiny minority **of our fellow creatures does not affect the material well-being of humans** one iota."n344 This skeptic challenged ecologists to list more than 10,000 species (other than unthreatened microbes) that are essential to ecosystem productivity or functioning. n345 "**The human species could survive just as well** if 99.9% of our fellow creatures went extinct, provided only that we retained the appropriate 0.1% that we need." n346   [\*906]   The monumental Global Biodiversity Assessment ("the Assessment") identified two positions with respect to redundancy of species. "At one extreme is the idea that each species is unique and important, such that its removal or loss will have demonstrable consequences to the functioning of the community or ecosystem." n347 The authors of the Assessment, a panel of eminent ecologists, endorsed this position, saying it is "unlikely that there is much, if any, ecological redundancy in communities over time scales of decades to centuries, the time period over which environmental policy should operate." n348 These eminent ecologists rejected the opposing view, "the notion that species overlap in function to a sufficient degree that removal or loss of a species will be compensated by others, with negligible overall consequences to the community or ecosystem." n349  Other biologists believe, however, that species are so fabulously redundant in the ecological functions they perform that the life-support systems and processes of the planet and ecological processes in general will function perfectly well with fewer of them, certainly fewer than the millions and millions we can expect to remain **even if** **every threatened organism becomes extinct**. n350 Even the kind of sparse and miserable world depicted in the movie Blade Runner could provide a "sustainable" context for the human economy as long as people forgot their aesthetic and moral commitment to the glory and beauty of the natural world. n351 The Assessment makes this point. "Although any ecosystem contains hundreds to thousands of species interacting among themselves and their physical environment, the emerging consensus is that the system is driven by a small number of . . . biotic variables on whose interactions the balance of species are, in a sense, carried along." n352   [\*907]   To make up your mind on the question of the functional redundancy of species, consider an endangered species of bird, plant, or insect and ask how the ecosystem would fare in its absence. The fact that the creature is endangered suggests an answer: it is already in limbo as far as ecosystem processes are concerned. What crucial ecological services does the black-capped vireo, for example, serve? Are any of the species threatened with extinction necessary to the provision of any ecosystem service on which humans depend? If so, which ones are they?  Ecosystems and the species that compose them have changed, dramatically, continually, and totally in virtually every part of the United States. There is little ecological similarity, for example, between New England today and the land where the Pilgrims died. n353 In view of the constant reconfiguration of the biota, **one may wonder why Americans have not suffered more as a result of ecological catastrophes**. The cast of species in nearly every environment changes constantly-local extinction is commonplace in nature-but the crops still grow. Somehow, it seems, property values keep going up on Martha's Vineyard in spite of the tragic disappearance of the heath hen.  One might argue that the sheer number and variety of creatures available to any ecosystem buffers that system against stress. Accordingly, we should be concerned if the "library" of creatures ready, willing, and able to colonize ecosystems gets too small. (Advances in genetic engineering may well permit us to write a large number of additions to that "library.") In the United States as in many other parts of the world, however, the number of species has been increasing dramatically, not decreasing, as a result of human activity. This is because the hordes of exotic species coming into ecosystems in the United States far exceed the number of species that are becoming extinct. Indeed, introductions may outnumber extinctions by more than ten to one, so that the United States is becoming more and more species-rich all the time largely as a result of human action. n354 [\*908] Peter Vitousek and colleagues estimate that over 1000 non-native plants grow in California alone; in Hawaii there are 861; in Florida, 1210. n355 In Florida more than 1000 non-native insects, 23 species of mammals, and about 11 exotic birds have established themselves. n356 Anyone who waters a lawn or hoes a garden knows how many weeds desire to grow there, how many birds and bugs visit the yard, and how many fungi, creepy-crawlies, and other odd life forms show forth when it rains. All belong to nature, from wherever they might hail, but not many homeowners would claim that there are too few of them. Now, not all exotic species provide ecosystem services; indeed, some may be disruptive or have no instrumental value. n357 This also may be true, of course, of native species as well, especially because all exotics are native somewhere. Certain exotic species, however, such as Kentucky blue grass, establish an area's sense of identity and place; others, such as the green crabs showing up around Martha's Vineyard, are nuisances. n358 Consider an analogy [\*909] with human migration. Everyone knows that after a generation or two, immigrants to this country are hard to distinguish from everyone else. The vast majority of Americans did not evolve here, as it were, from hominids; most of us "came over" at one time or another. This is true of many of our fellow species as well, and they may fit in here just as well as we do. It is possible to distinguish exotic species from native ones for a period of time, just as we can distinguish immigrants from native-born Americans, but as the centuries roll by, species, like people, fit into the landscape or the society, changing and often enriching it. Shall we have a rule that a species had to come over on the Mayflower, as so many did, to count as "truly" American? Plainly not. When, then, is the cutoff date? Insofar as we are concerned with the absolute numbers of "rivets" holding ecosystems together, extinction seems not to pose a general problem because a far greater number of kinds of mammals, insects, fish, plants, and other creatures thrive on land and in water in America today than in prelapsarian times. n359 The Ecological Society of America has urged managers to maintain biological diversity as a critical component in strengthening ecosystems against disturbance. n360 Yet as Simon Levin observed, "much of the detail about species composition will be irrelevant in terms of influences on ecosystem properties." n361 [\*910] He added: "For net primary productivity, as is likely to be the case for any system property, **biodiversity matters only up to a point**; above a certain level, increasing biodiversity is likely to make **little difference**." n362 What about the use of plants and animals in agriculture? There is no scarcity foreseeable. "Of an estimated 80,000 types of plants [we] know to be edible," a U.S. Department of the Interior document says, "only about 150 are extensively cultivated." n363 About twenty species, not one of which is endangered, provide ninety percent of the food the world takes from plants. n364 Any new food has to take "shelf space" or "market share" from one that is now produced. Corporations also find it difficult to create demand for a new product; for example, people are not inclined to eat paw-paws, even though they are delicious. It is hard enough to get people to eat their broccoli and lima beans. It is harder still to develop consumer demand for new foods. This may be the reason the Kraft Corporation does not prospect in remote places for rare and unusual plants and animals to add to the world's diet. Of the roughly 235,000 flowering plants and 325,000 nonflowering plants (including mosses, lichens, and seaweeds) available, farmers ignore virtually all of them in favor of a very few that are profitable. n365 To be sure, any of the more than 600,000 species of plants could have an application in agriculture, but would they be preferable to the species that are now dominant? Has anyone found any consumer demand for any of these half-million or more plants to replace rice or wheat in the human diet? There are reasons that farmers cultivate rice, wheat, and corn rather than, say, Furbish's lousewort. There are many kinds of louseworts, so named because these weeds were thought to cause lice in sheep. How many does agriculture really require? [\*911] The species on which agriculture relies are domesticated, not naturally occurring; they are developed by artificial not natural selection; they might not be able to survive in the wild. n366 This argument is not intended to deny the religious, aesthetic, cultural, and moral reasons that command us to respect and protect the natural world. These spiritual and ethical values should evoke action, of course, but we should also recognize that they are spiritual and ethical values. We should recognize that ecosystems and all that dwell therein compel our moral respect, our aesthetic appreciation, and our spiritual veneration; we should clearly seek to achieve the goals of the ESA. There is no reason to assume, however, that these goals have anything to do with human well-being or welfare as economists understand that term. These are ethical goals, in other words, not economic ones. Protecting the marsh may be the right thing to do for moral, cultural, and spiritual reasons. We should do it-but someone will have to pay the costs. In the narrow sense of promoting human welfare, protecting nature often represents a net "cost," not a net "benefit." It is largely for moral, not economic, reasons-ethical, not prudential, reasons- that we care about all our fellow creatures. They are valuable as objects of love not as objects of use. What is good for   [\*912]  the marsh may be good in itself even if it is not, in the economic sense, good for mankind. The most valuable things are quite useless.

#### No impact to biodiversity – previous mass extinctions prove

National Geographic no date (“Mass Extinctions, What Causes Animal Die Offs?,” National Geographic, Date Provided by the Wayback Machine, 2010, science.nationalgeographic.com, Available Online: https://science.nationalgeographic.com/prehistoric-world/mass-extinction, Accessed: 09/02/2013)

More than 90 percent of all organisms that have ever lived on Earth are extinct. As new species evolve to fit ever changing ecological niches, older species fade away. But [the rate](##) of extinction is far from constant. At least a handful of times in the last 500 million years, 50 to more than 90 percent of all species on Earth have disappeared in a geological blink of the eye. Though these mass extinctions are deadly events, they open up the planet for new life-forms to emerge. Dinosaurs appeared after one of the biggest mass extinction events on Earth, the Permian-Triassic extinction about 250 million years ago. The most studied mass extinction, between the Cretaceous and Paleogene periods about 65 million years ago, killed off the dinosaurs and made room for mammals to rapidly diversify and evolve.

# Misc

### Warming Impact

#### Warming causes extinction and turns disease and food security

Deborah Snow and Peter Hannam 14 (Deborah, senior writer with The Sydney Morning Herald , Peter, writes for Sydney Morning Herald, “Climate change could make humans extinct, warns health expert” March 31, 2014 Read more: http://www.smh.com.au/environment/climate-change/climate-change-could-make-humans-extinct-warns-health-expert-20140330-35rus.html#ixzz35mzFTYk5

Warming "threat": The rate of change has never been as fast as it is today. Photo: Glenn Campbell The Earth is warming so rapidly that unless humans can arrest the trend, we risk becoming ''extinct'' as a species, a leading Australian health academic has warned. Helen Berry, associate dean in the faculty of health at the University of Canberra, said while the Earth has been warmer and colder at different points in the planet's history, the rate of change has never been as fast as it is today. ''What is remarkable, and alarming, is the speed of the change since the 1970s, when we started burning a lot of fossil fuels in a massive way,'' she said. ''We can't possibly evolve to match this rate [of warming] and, unless we get control of it, it will mean our extinction eventually.'' Professor Berry is one of three leading academics who have contributed to the health chapter of a Intergovernmental Panel on Climate Change (IPCC) report due on Monday. She and co-authors Tony McMichael, of the Australian National University, and Colin Butler, of the University of Canberra, have outlined the health risks of rapid global warming in a companion piece for The Conversation, also published on Monday. The three warn that the adverse effects on population health and social stability have been ''missing from the discussion'' on climate change. ''Human-driven climate change poses a great threat, unprecedented in type and scale, to wellbeing, health and perhaps even to human survival,'' they write. They predict that the greatest challenges will come from undernutrition and impaired child development from reduced food yields; hospitalisations and deaths due to intense heatwaves, fires and other weather-related disasters; and the spread of infectious diseases. They warn the ''largest impacts'' will be on poorer and vulnerable populations, winding back recent hard-won gains of social development programs. Projecting to an average global warming of 4 degrees by 2100, they say ''people won't be able to cope, let alone work productively, in the hottest parts of the year''. They say that action on climate change would produce ''extremely large health benefits'', which would greatly outweigh the costs of curbing emission growth. A leaked draft of the IPCC report notes that a warming climate would lead to fewer cold weather-related deaths but the benefits would be ''greatly'' outweighed by the impacts of more frequent heat extremes. Under a high emissions scenario, some land regions will experience temperatures four to seven degrees higher than pre-industrial times, the report said. While some adaptive measures are possible, limits to humans' ability to regulate heat will affect health and potentially cut global productivity in the warmest months by 40 per cent by 2100. Body temperatures rising above 38 degrees impair physical and cognitive functions, while risks of organ damage, loss of consciousness and death increase sharply above 40.6 degrees, the draft report said. Farm crops and livestock will also struggle with thermal and water stress. Staple crops such as corn, rice, wheat and soybeans are assumed to face a temperature limit of 40-45 degrees, with temperature thresholds for key sowing stages near or below 35 degrees, the report said.

### Habitat Protection Good

#### There is more incentive to protect fragile marine habitats rather than destroy them

**The Pew Charitable Trust 14,** “How to Protect Habitat, Homes and Nurseries for Ocean Fish,” http://www.care2.com/causes/how-to-protect-habitat-homes-and-nurseries-for-ocean-fish.html

For example, scientists have found that fishing practices such as bottom trawling or dredging can destroy essential, fragile wildlife habitat on the ocean’s floor in a single pass. Research also has demonstrated that industrial pollution and agricultural runoff can damage nearshore and brackish estuarine habitats that serve as important nurseries for countless species of ocean fish. The massive seasonal dead zones documented in the Gulf of Mexico and Chesapeake Bay are just two examples of how our actions on land can have devastating results in the water. New research on our oceans, however, also provides a way forward. The science is clear on the ecological and economic benefits of habitat protection, which is an integral element of effective ecosystem-based fisheries management. Adequate amounts of productive habitats are critical to the development of vibrant marine ecosystems capable of supporting healthy fish populations, just as they are for animals on land. Rich collections of deep-sea corals off the coast of Alaska, for example, serve as a safe harbor from harsh ocean currents, providing necessary areas for fish to spawn, feed and take shelter from predators. These sites are home to an array of marine species, including Pacific ocean perch, rockfish and crabs. In fact, a study on the linkages between corals and fish populations by the North Pacific Research Board’s Science Program found that “64-72% of commercially important fish species in the Aleutians were associated with corals or sponges.” Several regional fishery management councils have moved ahead with forward-thinking plans to protect essential fish habitat. For example, in 2005 the North Pacific Fishery Management Council made a landmark decision to safeguard deep-sea corals from destructive bottom trawling in roughly 280,000 square nautical miles of ocean waters around the Aleutian Islands off the Alaskan coast, an area nearly twice the size of California. Yet, despite this step and other proactive regional efforts, national protection of fishery habitat remains uneven. The Magnuson-Stevens Act was amended in 1996 to require the National Oceanic and Atmospheric Administration’s Fisheries Service, or NOAA Fisheries, and regional fishery management councils to describe, identify, protect and enhance essential fish habitats “to the extent practicable.” However, undertaking specific actions to protect habitat, such as banning certain fishing gear types in sensitive areas, can often be deemed “impracticable” by regional officials. Federal fishery managers also have designated large swaths of ocean as essential fish habitat, but they have failed to follow through on protective measures by subsequently deciding that proposed enforcement tools were impracticable because of the size of the designated habitat. This practice must end.